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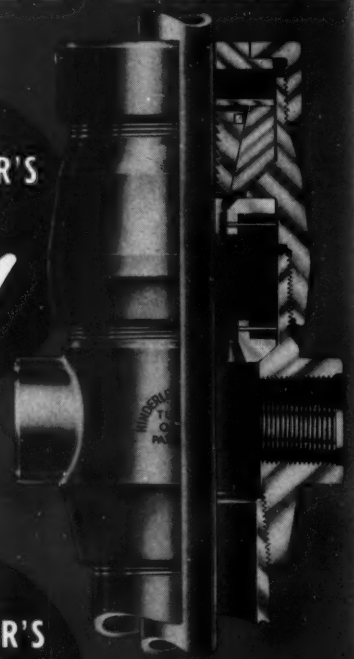

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Another 10 Per Cent

THE petroleum industry has had cost increases within its own operations during the past decade and it has had many more handed it from the outside. The latest is the action of the Interstate Commerce Commission in granting an emergency advance of 10 per cent in freight charges.

The oil industry and its customers will be called upon to absorb an important part of the additional $700,000,000 revenue which will accrue to the carriers because of this advance in rail rates. It should be kept in mind in this connection that the Monday upward adjustment is an interim advance pending hearings on requests for increases of 38 per cent in the East and 28 per cent elsewhere.

An immediate effect is the higher delivered costs of refinery products. Because of transportation shortages there is also an important movement of crude oil by tank cars. In the case of products one example will suffice. The rail rate on gasoline and other light products from Oklahoma (Group 3)—a basic rate of refiners for many years—was 42 cents per hundred pounds or 2.77 cents per gallon. The new rate will be about 3.05 cents per gallon. This is equivalent to one-third the prevailing spot refinery market for regular-grade gasoline in Group 3, which is the industry's return on its principal product around which its entire operations revolve.

The significance of rail-rate increases, of course, does not stop with crude oil and products. Freight rates are a major item in the delivered cost of equipment and materials used in the fields, refineries, and transportation facilities. Largely they are classified as heavy goods which either as raw material or finished products are transported several hundred miles by rail.

The sale of more than 1 million tons annually required to drill this country's wells in normal times often hinges on freight-rate advantages. Recent analyses had shown that higher rail rates were an important factor in the mounting costs of pipe-line and refinery construction.

Competent observers are in agreement that most of the carriers' difficulties stem from government direction, which over the past half century has steadily expanded to the point where it now amounts to complete control. Management, because of these controls, has been unable to cope with labor and changing competitive conditions and business generally and consumers are paying the bill.

The seriousness of the situation is now recognized even by ICC which stated that the higher rates "stimulate existing inflationary forces," and "increasing costs of operations now pose, and unchecked, will continue to pose a serious threat to the maintenance of adequate transportation service." There should be an object lesson to the oil industry and its customers in the present plight of the rail carriers.

High Court Refuses to Reconsider "Tidelands" Decision

WASHINGTON. — The U. S. Supreme Court has refused the petition of the State of California to reconsider its decision of last June in the "Tidelands" case, but has not yet acted on the proposed decree submitted by the U. S. Department of Justice and California's objection to this decree.

Some attorneys have raised numerous questions as to the exact interpretation of the June decision, and California asked that the language and meaning be clarified, even though the court did not alter its basic decision that the federal Government has rights to the submerged coastal strip.

Texas, Louisiana Suits Seen

Now that the court has refused to reconsider its decision, the way is open for the Department of Justice to file similar suits against other coastal states, particularly Texas and Louisiana. It is understood that such suits have been prepared for early filing, though it is possible they may be held up until the Supreme Court enters its decree in the California case. The court said last spring that if the parties were unable to agree on the form of a decree it would write its own.

The federal Government's claim covers only lands beyond low tide to the 3-mile limit and does not embrace bays, ports, harbors and lands between high and low-water marks. Lands beyond the 3-mile limit have been claimed by presidential proclamation. Inland states have shown some concern that under this ruling inland navigable waters might be affected. However, the Supreme Court has said in this regard that "state dominion over lands under inland navigable waters finds some argument for its support."

In asking reconsideration of the decision of the case California said in its petition that the federal Government could only base its claim on the fact that national power gives the federal Government the right to appropriate these properties and that such a course was contrary to all past decisions.

California has issued leases permitting various companies to operate the submerged lands. Operations by state lessees are continuing under a federal-state stipulation pending final settlement of the controversial issue.

Active Rotary Rigs Pass 2,000 Mark For New Record in Activity

CONTINUING a sharp upward trend that started in February of this year, active rotary drilling rigs in the United States passed the 2,000 mark September 29 to reach a total of 2,007, according to figures released by the Interstate Oil Compact Commission. This figure, for the fourth consecutive month, surpasses the all-time high of 1,842 reached during the war year of 1944.

September's total is 312 rigs more than for the same month last year. Oklahoma, Rocky Mountains, and the Pacific Coast showed the greatest increase in activity, precentagewise, with gains of 54, 56, and 31, respectively. However, on a numerical basis, the Gulf Coast and the West Texas-New Mexico-North Texas-Panhandle area led the country with increases of 76 and 82 rigs. The Illinois area was the only one in the United States to show a decrease in activity as compared with last year.

September's total figure of 2,007 is particularly interesting when compared with the estimated total of 2,800 available rigs in the nation. This would indicate that nearly 72 per cent of all rotary rigs are working. This is a rather high figure when all factors—such as moving to new locations, inactivity for maintenance, and near-obsolete rigs—are considered.

The accompanying table shows a comparison, by areas, of active rigs for August and September of this year and September 1946. As can be seen, Pacific Coast, Kansas, and the West Texas - New Mexico area accounted for the gain of 38 rigs in September as compared with August of this year. Oklahoma active rigs were reduced by 27 for the month for the sharpest loss of the group.

ACTIVE ROTARY RIGS

	September 1947	August 1947	September 1946
Pacific Coast	164	144	133
Oklahoma	224	251	170
Kansas	125	108	113
Rocky Mountains (including Western Canada)	188	185	132
North Louisiana, East Texas, and Arkansas	165	164	161
West Texas, New Mexico, North Texas, and Panhandle	504	472	422
Gulf Coast	526	527	450
Illinois (including Indiana, Kentucky, and Michigan)	111	118	114
Total United States	2,007	1,969	1,695

Use of Explosives in Gulf Held Unlawful

AUSTIN.—The use of explosives in geophysical explorations in the Gulf of Mexico is unlawful, a Texas attorney general's opinion held October 13.

The opinion held that a state statute prohibiting the use of dynamite in the waters of Texas, except for construction purposes, applies to the waters of the Gulf of Mexico within the state's boundaries and is constitutional.

The opinion had been requested by the state School Land Board following a public hearing in which fishermen and coastal citizens protested that dynamiting activities of oil companies were killing fish.

The opinion said that the use of explosives in the gulf are lawful only on lands leased from the state and then only when necessary in connection with construction work. The opinion further stated that private concerns which have obtained geophysical information on gulf lands without permit or lease are liable to the state in damages for the value of the privilege so exercised.

Attorney General Daniel will meet with Galveston and Jefferson County officials in Galveston October 15 to discuss the enforcement of the laws interpreted in the opinion.

The oil-company executives withheld immediate comment on the opinion.

Fourth Quarter Steel Exports Announced

WASHINGTON.—Total exports of steel-mill products licensed for the fourth quarter of 1947 total 557,150 short tons, including all presently approved steel requirements for various special projects abroad of vital interest to the United States, the Commerce Department has announced.

Included in the quotas are 50,000 tons of welded casing and oil line pipe and 40,000 tons of seamless casing and oil line pipe.

NPC Undertakes Four New Projects, Including Marshall Plan Study

by Henry D. Ralph

WASHINGTON.—Four new projects were undertaken by the National Petroleum Council at its fall quarterly meeting October 9, dealing with petroleum requirements under the Marshall plan, the world tanker situation, idle inventories of petroleum equipment, and maintenance of winter transportation on the Illinois River.

A vigorous attempt was made by B. L. Majewski, Deep Rock Oil Corp., to have the council take steps to improve the supply and distribution of petroleum products which may be short this winter, but he was ruled out of order in bringing up a new subject which had not been cleared through the agenda committee. He was told to submit his ideas to the Oil and Gas Division for possible referral to the agenda committee for later consideration.

Following the meeting Majewski announced he would write OGD at once, with the request that his letter be circulated to the industry. Much of his plan, he thinks, could be put into effect by OGD without council action, but it is possible that a special meeting of NPC might be called to consider it.

In general, Majewski wants the Government to request all refiners to put a voluntary ceiling on octane rating of motor gasoline, reduce the yield of gasoline and increase the yield of fuel oil, and trade crude, products, and transportation facilities so as to get the maximum refinery runs and geographical distribution of needed products. There was some thought that such a program might eventually constitute a revival of the war-time directives requiring sharing of pipe lines and terminals, allocation of crude to refineries, and equitable distribution of products among dealers. Majewski argued that this could be accomplished by voluntary compliance with a request of a government agency, even without any statutory control powers, and that such a request from OGD would be just as legal, practical, and necessary as OGD's recent request that refiners set aside certain quotas for government use.

The request of the 16 European nations cooperating under the Marshall plan was explained in general terms by State Department officials and others, but the council was not given detailed statistics on the petroleum and equipment involved. At the request of OGD the council authorized the creation of a committee to analyze this part of the Marshall plan requests when details become available, and to report to the council.

The council also directed its materials committee to survey the oil industry to ascertain what items of equipment and supplies are not now being used but which might be available for distribution to other companies. This project was suggested by D. P. Hamilton, a member of NPC, who stated that it might uncover much surplus not now known by the companies owning it, and could be of use in relieving the present shortage of steel and equipment.

The committee on tanker transportation was reactivated at the request of OGD and directed to make a study of the unfavorable change in the domestic and world tanker situation and the prospect that many areas dependent on marine transportation may be short of supplies.

Transportation Committee Requested

Another OGD request adopted calls for creation of a committee to ascertain the value for oil transportation of keeping the Illinois waterways system free of ice this winter. Max W. Ball, director, OGD, explained that several government agencies are considering ice-breaking operations and desire information on the assistance this would be to the oil industry.

The only extensive reports received by the council were from its committees on materials and on military and government requirements. The former consisted chiefly of the detailed study of oil pipe production and shipments presented to the Oklahoma City convention of the Independent Petroleum Association of America last month by its committee on oil-field material shortages. A covering letter by Claude P. Parsons, chairman of the NPC committee, pointed out that this study shows that large shipments of line pipe and casing are being exported to foreign governments in which Americans have little, if any, petroleum interests. Parsons also criticized the Government's action in placing casing under export controls, saying that exports of casing can better be determined by the oil industry and the casing manufacturers.

The committee on military and government petroleum requirements reported that military demands for several products have increased greatly since the last council meeting, but that the industry is meeting most of the requirements. It suggested a number of changes in procurement methods and refinery operations to provide the Government with its needs. *(See separate story, this page).*

An operating budget of $50,000, the same as at present, was approved by NPC for 1948, the sum to be raised by voluntary assessments of members. The terms of all members of the council who were appointed as individuals for 1-year terms will expire prior to the next regular meeting, scheduled for mid-January, and in the meantime new appointments presumably will be made by the Secretary of the Interior. Ex-officio members will remain on NPC during their terms as heads of the associations they represent.

Most Current Military Requirements Covered But Second-Half Outlook Poor

WASHINGTON.—Military requirements for petroleum products during the fiscal year 1947-48 have increased 10.4 per cent since the first estimates were made last May, including increases of 33.6 per cent in aviation gasoline and 38.6 per cent in motor gasoline, it was reported to the National Petroleum Council by its committee on military and government petroleum requirements.

In spite of these increases the industry has covered virtually all requirements for the first half of the year except for Navy diesel and fuel oil, a fact cited by committee chairman Howard W. Page as an outstanding performance by the industry in view of the supply difficulties which have been experienced this summer.

The outlook for the coming months is not so bright, however, and the committee called particular attention to prospective shortages of various products in certain areas of procurement and made a number of suggestions for revising government lifting schedules and refinery operations to meet the requirements.

The largest increase in demand is in 115/145 aviation gasoline, and the committee recommended that refiners produce as much of this as possible and that the military substitute 100/130 grade to a certain extent. To produce this aviation fuel will require virtually all the alkylate

made in this country, and the committee observed that this will require abandonment of plans of many refiners to use alkylate in blending motor gasoline. It is also suggested that the planned purchases of aviation gasoline on the West Coast are higher than the industry's productive capacity in that region, and that the military should ship a portion of its West Coast requirements from the East or Gulf coasts.

Navy diesel and Navy special fuel oil are the products which present the most serious problems, and the committee urged all refiners to give this immediate attention. It suggested that refiners unable to meet Navy specifications make exchanges with refiners who can do so but are short of other distillates. It also pointed out that West Coast refineries may not have the capacity to produce the amounts requested by the military in that region.

A supplemental report on aviation lubricating oils pointed out that wartime stocks are being depleted and procurement requirements will rise rapidly during the coming months and soon will reach 16,000,000 gal. annually. The committee suggested that refiners make plans for increasing their output of avlubes by next spring to meet this demand.

NPC Refuses Aid in Tideland Lease Draft

WASHINGTON.—Blunt notice that the oil industry will fight every effort of the federal Government to control leases on submerged lands anywhere off the coast of the United States was served on the Interior Department by the National Petroleum Council last week.

The council adopted a recommendation of its agenda committee that it decline the request to create a committee to advise with the department in drafting legislation to establish a leasing policy and administrative machinery for exploration and drilling both in the so-called tidelands strip out to the international limit and also on the Continental Shelf extending farther out under the ocean in many areas.

The refusal was based on four grounds. (1) Cooperation in drafting legislation would imply an assumption that the federal Government rather than the states owns title to these areas, and the industry does not agree, despite the Supreme Court decision of last June. (2) There is little prospect that Congress will enact legislation for federal leasing of submerged oil lands. (3) The public interest will be better served by state control than by federal control. (4) The Continental Shelf, claimed for the United States by presidential proclamation, properly belongs to the appurtenant states rather than the federal Government.

This action is plain warning that the oil industry not only will refuse to cooperate in the federal control scheme but also will oppose every step toward congressional legislation to put the scheme into effect.

The request for an advisory committee was made to the council by Max W. Ball, director of the Oil and Gas Division, who stated that the Department of the Interior is formulating for submission to Congress a proposed policy and implementing legislation with respect to the exploration and development of such lands underlying the marginal seas, including the Continental Shelf, as may be owned by the federal Government.

Ball said the Department intends submitting this to Congress at the earliest possible date, in spite of the fact that the Supreme Court's decision leaves many issues unsettled, including the status of lands off the shores of states other than California, and he added that there are many novel and difficult problems of policy and practical operation on which the advice of the oil industry would be helpful.

Phillips' Production Personnel Hold Thirteenth Annual Meeting

by Kenneth B. Barnes

BARTLESVILLE, Okla.—In a 2-day program here October 13-14, 170 members of the production department of Phillips Petroleum Co. examined their latest development for improving drilling, completion, and oil and gas-producing operations. It was the thirteenth annual meeting of the department, and the program and attendance both scored new records.

Basically, the conference was of a technical nature, with 28 separate papers and reports appearing on the agenda. Some dealt with equipment, some with maintenance, and others featured new techniques and procedures designed to improve efficiency and result in higher production output and lessened costs.

Phillips Petroleum is now producing in the United States slightly more than 100,000 bbl. per day, net. This flow of crude oil, along with producing and selling approximately 375 billion cubic feet of natural gas per year, comes under the direct supervision of the company's 23 district field offices.

23 Production Districts

One idea of the scope of the problems and solutions, present and future, that the Phillips supervisors, engineers, and research men had to talk about at the present Bartlesville meeting, can be envisioned from the locations of these 23 production districts—where the operations actually are. Scattered over a big part of the country's oil territory, different drilling and producing conditions are of course encountered in each of the 23 separate district areas. The annual meeting is therefore designed in part to enable the districts to compare experience, exchange information and know-how.

In Kansas, Phillips has four production districts and offices, 6 in Oklahoma, 1 in North Texas, 2 in West Texas, 1 in South Texas, 1 in New Mexico, 1 in Colorado, 3 in Gulf Coast territory and one each in Louisiana, Arkansas, Mississippi, and Illinois. These 23 district producing areas channel into 8 division operating points. On top of those are two "regional" operating points, the northern office being located at Oklahoma City and the southern one at Houston.

There also is a drilling-tools division with three bases: Oklahoma City, Odessa, and Houston. One drilling improvement reported at the meeting by J. R. Pettigrove, as to field results and what it is doing in bettering drilling conditions was carboxylmethylcellulose, probably now better known as "Driscose" drilling-mud compound. This new product is handled by an affiliate, Drilling Specialties Co.

On maintenance and operating problems, "Scraping of Water Lines" was discussed as to the Pantex water system (Panhandle field) by J. N. Perkins, and the Iron station—Burbank field system by M. L. Atkinson.

Two reports on "Water-Injection Techniques and Factors Affecting the Plugging of Input Wells" were given by P. G. Carpenter and E. N. Washburn. Phillips is one of the largest operators of secondary-recovery water-flood projects, and the firm also owns properties whose future reserves by this method run into very large figures.

On equipment, two presentations "Demonstration (with models) of the Physical Properties of Various Materials and Pieces of Equipment," were made by M. E. Holmberg and G. G. Hebard. Harold S. Kelly, chief engineer, gave a review on improvements and possible new developments in oil-well tubing. "Rotation of Casing During the Placement of Cement, and Use of Vertical Casing Scratch-

(Continued on page 193)

this week

GOVERNMENT—National Petroleum Council at quarterly meeting in Washington decides to undertake study of petroleum requirements under Marshall plan, reactivates tanker committee because of the currently deteriorating tanker supply. . . . Council also directs survey of industry equipment with a view to improving distribution and use of what is already available. . . . Military and government-requirements committee of NPC reports industry has covered nearly all needs for the first half of the 1947-48 fiscal year but warns of possible shortages for the second half. . . . Committee asks increased output of aviation lubricants since wartime stocks are near depletion. . . .

TIDELANDS— U. S. Supreme Court refuses to reconsider last June's 6-2 decision holding that federal Government owns the submerged areas off California's coast. . . . Ruling apparently clears way for Department of Justice suits against other states such as Texas and Louisiana. . . . ¶National Petroleum Council turns down request of Oil and Gas Division that it set up committee to assist Department of Interior in drafting legislation for a leasing policy for federal submerged lands. . . . ¶Texas attorney general holds use of explosives in geophysical exploration in the Gulf of Mexico is unlawful under a Texas law. . . .

SUPPLY— Socony-Vacuum brings first of three tanker loads of Middle East crude to Paulsboro (New Jersey) refinery to relieve tight crude supply on East Coast. . . . ¶Prospect of shortages of fuel oil, particularly along Eastern Seaboard, becomes subject of increasing concern to industry leaders. . . . Predictions of fuel-oil rationing in the East before next spring heard. . . . M. J. Rathbone, Standard of Jersey president, says situation in Midwest and the East will be "touch and go for the next 6 months." . . . Stock position of heating-oil products considered weak. . . . ¶Ninety-six more government tankers ordered into service under White House directive to relieve increasingly acute shortage. . . . Little immediate help seen from move since repairs and remodeling will require weeks. . . .

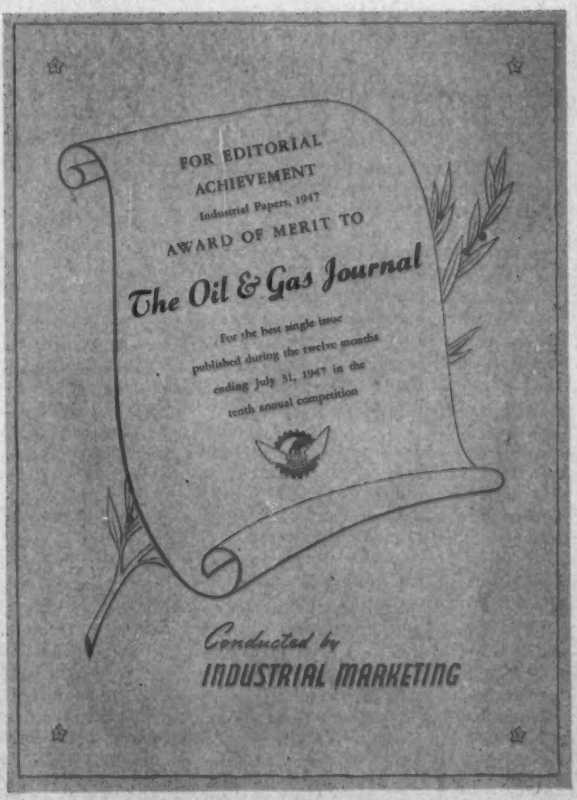
PRICES— Products prices through Midwest moved upward as companies pass on amount of 10 per cent freight rate increase authorized by ICC and made effective October 13 by railroads. . . . Market shows other advances independent of freight increase. . . . Deep Rock announces higher tank-wagon and tank-car prices for distillate heating oils and diesel fuels. . . .

REFINING—WAA report of sale of war-built government high-octane plants shows only 7 of original 33 offered still remain on available list. . . . Report shows 22 plants sold in whole or in part for $53,700,000. . . .

NATURAL GAS— FPC grants Texas Eastern Transmission permanent certificate to operate Big Inch system, including section to Philadelphia. . . . Few reservations attached to approval order. . . . ¶Construction of $100,000,000 line by Michigan-Wisconsin Pipe Line reported endangered by Securities and Exchange Commission motion to disapprove reorganization plan of American Light & Traction Co. . . .

STATISTICAL—U. S. crude production reaches another all-time high at 5,260,680 bbl. daily during week ended October 11. . . . Figure represents an increase of 49,245 bbl. daily over the previous week. . . . ¶Texas also set new production record, up 18,250 bbl. to 2,376,350 bbl. daily. . . . ¶Unprecedented tempo of exploratory operations shown by report that active rotary rigs in the United States totaled 2,007 September 29, a new record. . . . ¶Well completions for the week ended October 11 total 710, against 698 the previous week. . . . Week's completions include 96 wildcats. . . .

For the third successive year The Oil and Gas Journal has won the award of merit in a national contest participated in by industrial magazines. Shown here is a reproduction of the certificate that has been presented to the Journal's editor. The award was given to the Journal's Gulf Coast Number of May 31, which featured developments on this important area, plus a four-color map of oil and gas fields



Texas Eastern Given Permanent Big Inch Certificate

WASHINGTON.—The Federal Power Commission has issued Texas Eastern Transmission Corp. a permanent certificate to operate the entire Big Inch pipe-line system in natural-gas service, including service to Philadelphia and the eastern Pennsylvania area.

The only conditions imposed by the certificate are that Texas Eastern make four relatively small sales contracts in areas adjacent to its line west of Ohio; that during the coming winter it continue to make available 20,000,000 cu. ft. per day to Panhandle Eastern Pipe Line Co. or its customers; that until the line reaches full capacity, gas be allocated to customers in the Appalachian area under a formula prescribed by FPC rather than by the contract terms; and that during the present shortage period 5,000,000 cu. ft. per day be held available for emergency allocation by FPC in the Appalachian area.

The commission rejected as not in the public interest all contentions that gas should not be introduced into new areas in the East or that the total capacity should be allocated to the Appalachian area, and also the requests for service by a number of communities not immediately adjacent to the line.

Communities Claim Public Interest

Of general interest to the entire gas industry is the commission's action on the claims of a considerable number of communities that the public interest requires that they be served by the line, even though they have no purchase contracts, inasmuch as the full capacity of the line is 15,000,000 cu. ft. daily above the primary deliveries called for in present contracts. On the other hand, companies having contracts with options for additional gas beyond primary deliveries argued that they are entitled to the quantities for which they have contracted and that the commission is without authority to question their rights to the contract quantities, and that by reason of these contracts their rights cannot be disturbed by showing that the public interest may require other disposition of the pipe-line sales capacity. On this point the FPC said:

"We do not agree that our authority under the Natural Gas Act is so limited. The commission has an obligation under the act to weigh the public interest and reasonably condition any certificate issued so that the full public interest will be served."

Accordingly the FPC required service to four areas but rejected the claims of others, basing its actions on the need for gas, amount required, and distance from the main line in each instance.

The commission also expressed the opinion that Texas Eastern should supply relatively minor quantities of gas to meet the reasonable needs of various small communities along its line provided suitable contract can be worked out.

Under the temporary operating certificate issued last March, Texas Eastern was authorized to construct 10 compressor stations and the new certificate authorizes 11 more. Of the 21, five will be the conventional gas-engine-driven reciprocating-type compressor stations with thirty-six 1,000-hp. compressor units installed. The other 16 stations will be equipped with centrifugal-type compressors powered by electric motors totaling 117,500 installed horsepower.

The centrifugal-type compressor, said FPC, is an innovation, and has not heretofore been used by gas companies in the operation of high-pressure pipe lines. However, the opinion stated that full engineering data indicates that they will operate satisfactorily and at reasonable installation and operating cost. The five reciprocating-type compressor stations will be distributed along the system in such a way as to maintain even pressure and balance. Eastward from Little Rock, Ark., where the Big Inch and Little Big Inch lines converge, the two lines will be tied together and operated as one.

Estimated Input Requirements

The estimated input requirements of the system by August 1948 will be 450,000,000 cu. ft. per day to provide sales capacity of 435,000,000 cu. ft. Texas Eastern has entered 13 contracts for the purchase of gas in Carthage, North Cheek, Whelan and Jefferson-Rodessa fields in Texas and the Lucky, Northeast Lisbon, Hico, Knowles, Tremont, and Choudrant fields in Louisiana. These contracts provide 120 per cent of requirements for 5 years, 106 per cent for 8 years, 102 per cent for 10 years, 96 per cent for 15 years, and 91 per cent for 20 years. In addition the company is negotiating additional contracts for gas, including gas now being flared. FPC said the reserves in these fields justify the conclusion that the requirements of the pipe line will be met, and there can be no question but that ample gas is available to meet present and future requirements.

The company has five contracts in the Appalachian area totaling 340,000,000 cu. ft. per day, and two in Philadelphia totaling 80,000,000 cu. ft. These total 420,000,000 cu. ft., whereas the capacity of the line is expected to be 435,000,000 cu. ft. by August 1, 1948. During the past winter 20,000,000 cu. ft. per day of Big Inch gas has been allocated to Panhandle Eastern territory, and FPC conditioned its certificate to Texas Eastern on continuing this until April 30, 1948, and reserved the right to extend this allocation until 1949 if necessary.

Union Contentions Dismissed

Railroad, coal, and union labor interests opposed permitting gas to enter the Philadelphia area, but the FPC dismissed this objection, saying there is a real need for natural gas there. Some companies taking Big Inch gas in the Appalachian area and moving it into northern New York State objected to the Philadelphia service until they can obtain all the gas desired, but FPC said they want the gas for expanding their markets and this need is outweighed by Philadelphia's and by the fact that Texas Eastern must purchase the entire Big Inch system, which reaches Philadelphia, under its contract with War Assets Administration.

Texas Eastern plans to end trunk-line service at its Skippack Junction station near Philadelphia. From that point the Big Inch system consists of two 20-in. lines to Linden, N. J., and the company proposes to use them for gas storage, available to Philadelphia in an emergency. At a pressure of 554 psi. they will hold 60,000,000 cu. ft. of gas, and with the addition of a small compressor station they will hold 85,000,000 cu. ft.

FPC also approved Texas Eastern's financing plans and earnings prospects, and declared the project is an economically feasible undertaking and the need for natural gas along the route clearly warrants the permanent conversion of the Big Inch lines to natural gas.

Gas Turbine Laboratory Dedicated at M. I. T.

A new gas-turbine laboratory of the Massachusetts Institute of Technology was dedicated last week with ceremonies attended by a group of industrial leaders representing almost every field of engineering.

The two-story building, of heavy reinforced-concrete construction, was made possible by grants totaling more than $500,000 from a group of leading industries interested in fundamental research on gas turbines. The Navy contributed considerable equipment.

Maximum Use of Gasoline Quality Imperative, Holaday Says

by Arch L. Foster

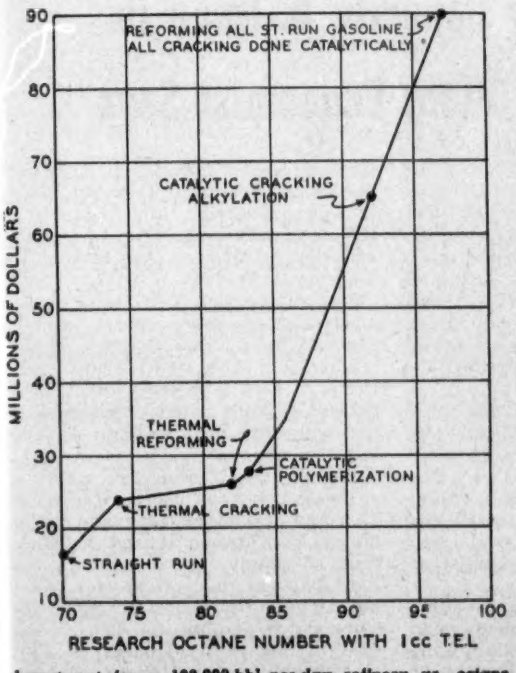
PROPER utilization of the essential qualities of motor fuels to the maximum degree permitted by the practicable engineering design of automotive engines and cars, is necessary before the refining industry spends billions of dollars to supply higher and higher antiknock quality, W. H. Holaday, head of the Socony-Vacuum Oil Co., Inc., laboratories and an authority on petroleum fuels, indicated before a meeting of oil and automotive industry officials and technologists in Detroit.

Holaday discussed at length the mutual problem of automotive power-plant fuels in the light of the most recent developments, before a meeting of Committee D-2, Fuels and Lubricants, of the American Society for Testing Materials, and his broad summation of the problems and their impact on the two industries appeared to be accepted wholeheartedly by the gathering which included many prominent scientists, engineers, and technologists.

Not only does our automotive equipment fail to utilize to the most efficient degree the antiknock and other essential properties inherent in our present-day motor fuels but the best of our designing and engineering knowledge is not used to anything approaching the fullest extent in obtaining the maximum efficiency and economy from the use of these fuels, he indicated. Under normal conditions nearly the entire list of cars now on the road can be operated satisfactorily practically all the time on 86 Research octane number, Holaday stated. Under certain peak conditions fuels up to 99 Research octane number will service all cars satisfactorily, and this requirement may include up to 10 per cent of the total fuel demand. The oil industry can easily supply fuels of the higher rating up to 10 per cent of the total consumption of about 2,000,000 bbl. per day, and at the same time can make 86 Research for the remainder of the supply, he said.

Mounting Costs

Current production and prospects for crude oil indicate that the cost of increasing materially the output of crude is mounting with alarming rapidity and will continue to rise, according to the best information available. To produce and handle the additional 1,000,000 bbl. of crude per day, as indicated by present trends, will cost the oil industry an extra $3 billion, Holaday said estimates from the best engineering and economic data available show. It is expected that within the next few years this much more crude must be produced and processed. By quick calculation from the curve showing relationship between refining investment and the octane rating of motor fuel produced, it is deduced that another $2.8 billion to $3 billion must be spent by the refining division of the industry to make octane number fuel of 95-98 Research to supply the volume demand of the world. Thus a total of some $6 billion additional must be spent by the industry to supply volume and quality demands if "octane race" continues.



Investment for a 100,000-bbl.-per-day refinery vs. octane number of gasoline produced

Cracking and other improvements in refining were developed primarily to add to the production of motor fuel and not for quality improvement, which came as an added return from the operation, Holaday pointed out. Consequently the additional cost of the thermal cracking is charged to production of more, not necessarily better gasoline, and the process therefore has been relatively inexpensive. Catalytic cracking (in part at least), alkylation, and other processes add to the cost and must be charged largely against product quality, however.

"Unfortunately the industry already has taken advantage of most of the low-cost octane numbers," Holaday said, "so that any further substantial increase in octane number will require reforming more of the straightrun naphtha and will therefore consist of expensive octane numbers."

Extending this thought, Holaday stated that a 100,000-bbl.-daily refinery to include thermal cracking, thermal reforming, catalytic polymerization and ordinary distillation, will cost only about $27,500,000 and will produce gasoline of 78/83 octane number with 1 cc. of tetraethyl lead; whereas a plant of the same size, taking in all the processes for making motor fuels of 87/97 octane number will cost now $90,000,000, or $900 per barrel of crude processed per day (see accompanying chart). Such a cost, if extended over the industry's required capacity, will run the additional investment of the refining industry to near $6 billion, calculations indicate, or more than three times the cost of the earlier type to supply fuels of around 80 octane number.

Conclusions and Recommendations

The conclusions and recommendations arrived at in the discussion of the entire problem are outlined as:

1. The octane-number level of motor gasoline will not increase at as fast a rate as it has in the past because of the huge expenditures that must be made in the next few years to increase production and refining capacity.

2. Higher octane levels will be made available in future; but the automotive engineer must realize before any sizable increases in compression ratios are incorporated in engine designs that the advances are made at the expense of lower yields of usable gallons of fuel per barrel of crude consumed.

3. It is believed that a dual fuel system which permits use of high-octane fuels during only the small percentage of the time when such quality is required, will utilize the country's resources more fully and will permit the refining industry to meet demands more economically. Improved torque converters will improve economy.

International

WORLD-WIDE OIL DEVELOPMENTS

Socony-Vacuum Bringing in Three Middle East Crude Shipments

IN order to relieve in part the tight oil situation along the Eastern Seaboard, Socony-Vacuum Oil Co., Inc., brought in the first of three tanker loads of Middle East crude oil to its Paulsboro (N.J.) refinery last week. Whether additional Middle East crude will be brought to the United States by this company in the immediate future has, apparently, been undecided, but a spokesman admitted it was a possibility.

Earlier this year B. Brewster Jennings, Socony-Vacuum president, indicated that Middle East crude would be shipped to the United States. *(The Oil and Gas Journal, May 31, page 113).* Last week Jennings said that the second load of Persian Gulf crude oil was slated to arrive at Paulsboro early in November and the third tanker about a month after that.

In explaining that these three tanker loads were spot purchases, Jennings said that the likelihood of additional amounts of Middle East crude oil coming to the company's United States refineries in the immediate future was decreased because of the current tanker shortage. However, Jennings' statements were made before the White House announcement late last week that 96 additional tankers would be placed in service, and this may change the over-all picture.

First Shipment Last Year

The first tanker load of Middle East crude oil was brought to the United States last year when Gulf Oil Corp. delivered 115,000 bbl. of Kuwait crude to its Philadelphia refinery. Processing the first Middle East crude in the United States, Gulf found that the yield was characterized by more than 50 per cent distillate fuel oils and catalytic charging stock. *(The Oil and Gas Journal, September 21, 1946, page 162).*

Gulf's test run also show that 16 per cent of the Kuwait crude may be run to a light (No. 1) fuel oil showing about 45° A.P.I. gravity, with approximately 10 per cent as No. 2 fuel oil of 36° A.P.I. gravity. Socony-Vacuum is bringing in one tanker load of Kuwait crude and two from Saudi Arabia. In all, the company will have shipped about 345,000 bbl. of Middle East crude to the United States by early December.

While Socony-Vacuum declined to reveal the cost per barrel of this Middle East movement, it is no secret that the United States Maritime Commission rate from Abadan to Paulsboro is $13.25 a ton, and Ras Tanura in Saudi Arabia is only a short distance from Abadan. The tanker rate per ton from Fahail, the loading terminal in Kuwait, to Paulsboro is $13.05. U. S. Maritime tankers are being used in this movement by Socony-Vacuum. As yet there is no posted price for crude oil in the Persian Gulf, but reliable sources state that Socony - Vacuum probably brought in this crude oil at a cost in excess of $2.50 per barrel. Transportation charges alone account for approximately $1.70.

In using Maritime Commission tankers, Jennings pointed out that the long and expensive haul from Persian Gulf ports probably will preclude any sizable imports into the United States at least until completion of the Trans-Arabian and other "big inch" Middle East pipe lines.

As a matter of fact, Jennings explained, it is doubtful if any appreciable quantities of Middle East crude oil will be shipped to the United States for many years after the pipe lines are laid as demands in the Eastern Hemisphere are continually increasing.

Refinery Capacity Is Issue in Marshall Plan, Economist Says

IF the output of United States refineries is used as a partial method of meeting the 4-year Marshall plan for the 16 Western European nations, more tankers would have to be made available to bring foreign crude oil into this country. The only other means of increasing petroleum product availability to Europe is acceleration of the Eastern Hemisphere refinery program.

This is the opinion of Dr. Courtney Brown, head of the petroleum economics division, Standard Oil Co. (N.J.), who told The Oil and Gas Journal that apart from the availability of foreign exchange (which the Marshall plan presumably will cure) the question of refinery capacity is the central issue.

Brown pointed out that by some coincidence the Marshall planners in Paris arrived at substantially the same projected Eastern Hemisphere refinery capacity program which the foreign refining industry at large had in mind a year ago. However, since then the industry, due to lack of steel and other necessary materials, including manpower, has revised its program downward.

In stating that United States crude-oil production is expected to remain constant for the next 4 years, Brown readily admitted that demand will rise and that the recent United States transition from a net exporter to a net importer probably would not materially change.

With crude-oil production rising at a reasonable rate in the Caribbean area and at a spectacular rate in the Middle East, Brown likened the world flow of supply and demand to billiard balls in the bottom of a bowl. Move one, he said, and all others assume a new equilibrium. Thus, a significant change in demand or level of consumption, or a change in supply, will modify movements in other

parts of the world. From this, he concluded, the idea of interdependence becomes obvious.

On a world-wide basis the production of petroleum products probably limits demand—a situation likely to continue during the next 4 years. If the United States should be called on to export a greater supply of products, more crude-oil imports would be a prime necessity, or the industry would fail to meet increasing United States demand, Brown observed.

In short, the Marshall plan requirements can hardly be met from resources within the United States under prevailing circumstances. However, the Jersey Standard official pointed out, it is not essentially a question of whether the United States can supply the 16 Western European nations' demands for petroleum products, but whether the refinery program abroad can be achieved.

German Geologists and Geophysicists Organize New Society

HOLDING their first open technical meeting in 15 years, more than 500 geologists and geophysicists gathered in Hanover, Germany, recently for 3 days of discussions of oil exploration work.

The meeting, held at the invitation of the German Office for Soil Research, also was attended by a number of foreign guests, members of the military government, and state secretaries of the administrative province. Thirty-seven lectures on the present oil-geological situation in Germany were presented, and the group decided to organize the German Society for the Science of Petroleum, and a German Geological Society for the American-British bizonal area.

The main part of the meeting was formed around reports dealing with 26 German oil fields. During the last 15 years several thousand wells have been drilled in northwest Germany, considerably increasing the theoretical and practical information about the subsurface. The exchange of information at the meeting helped clarify the complicated tectonical, stratigraphical, and facial conditions of northwest German formations.

It was brought out at the meeting that, among the numerous Mesozoic rocks with oil-producing possibilities in northwest Germany, preference is still given to the Zechstein as the source rock of the oil. The Ems districts near The Netherlands border was placed first with regard to reserves among German oil areas.

Location of Fields

Reports at the meeting showed that 20 northwest German oil fields are bound to salt domes, 15 being of the flank type, and 5 of the crestal type. Six fields are located on anticlines, including those of the Ems district. The oil beds are the main dolomite and the porous shale of the middle Zechstein, the coral oolite of the Malm, the shell banks of the Wealden, the debris layers of the Neocomian, the chalk of the Upper Cretaceous, the sands of the Rhaetic, the lower Liassic, lower Dogger, Cornbrash, Valendis and Lower Eocene. Almost all the fields are poor in gas content (with the exception of Bentheim) and subject to edge water drive. Total production in 1946 was about 4,380,000 bbl.

Geophysical results of general interest, it was reported, were obtained from the destruction of the German island of Helgoland in April by English and German explosives. The depths of the North German area of sedimentation were established as approximately 3.1-6.2 miles, while the top of the Sima near Goettingen had been encountered at a depth of 17 miles and at 25 miles at the edge of the Alps. The thickness of the continent, hitherto assumed as 37-62 miles, was thus considerably reduced.

International

WORLD WIDE OIL DEVELOPMENTS

Creole Output Nears 600,000 Bbl. Daily

STEADILY climbing toward the 600,000-bbl. daily mark, Creole Petroleum Corp.'s Venezuelan crude-oil production for August was 598,062 bbl. daily, the highest since the company's all-time record of 599,192 bbl.

Creole refined 54,766 bbl. daily in August, compared with 67,815 in July. Of the August figure, 45,195 came from the Caripito refinery and 9,571 bbl. from La Salina.

Eighteen development wells and four exploratory wells were completed, all oil producers. Three wildcats were dry holes; they were wells J-428, JGE-32 and La Pica-2, drilled to an average depth of 6,036 ft.

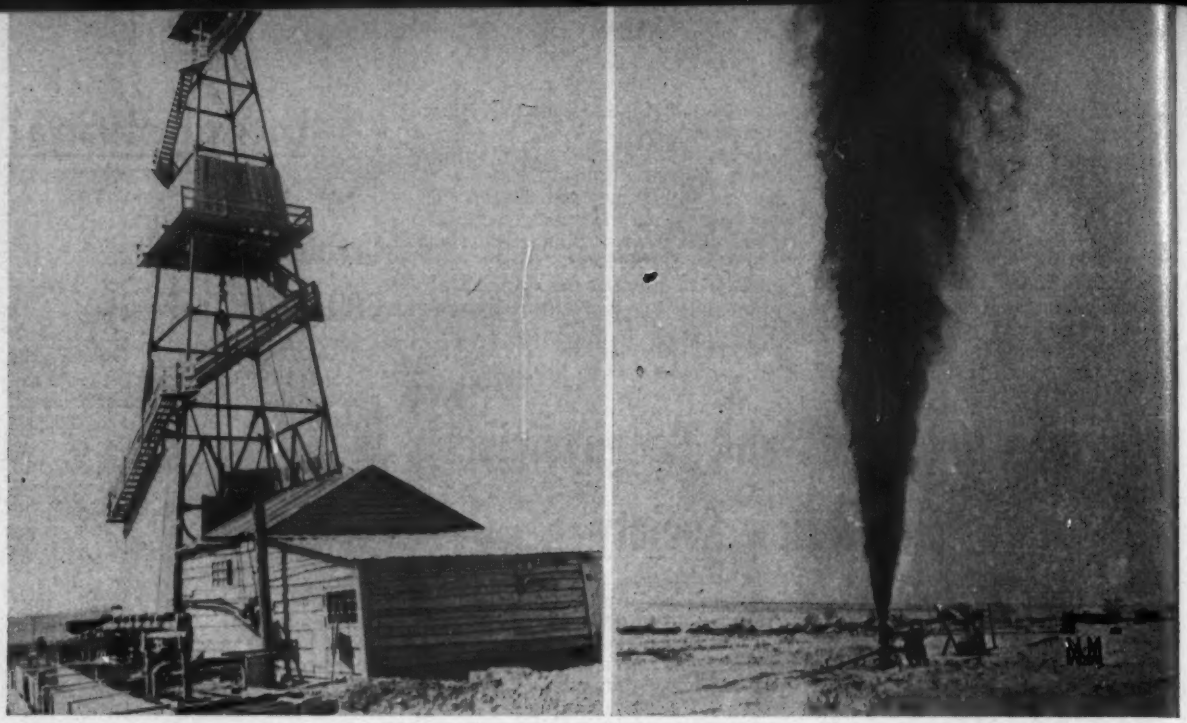
The fields where the producers were brought in, their average initial production and depth follow:

Development wells: Bolivar Coastal (B.C.F.), nine, 590 bbl., 4,651 ft.; Mulata, three, 211 bbl., 4,893 ft.; Quiriquire, three, 590 bbl., 4,228 ft.; Jusepin, two, 350 bbl., 4,326 ft.; and San Joaquin, one, 494 bbl., 4,335 ft.

Exploratory: Bolivar Coastal (B.C.F.), one, 1,008 bbl., 6,514 ft.; Jusepin area, one, 224 bbl., 6,036 ft.; Quiriquire, one, 505 bbl., 4,799 ft.; and Roble, one, 467 bbl., 6,379 ft.

EDITOR PRESENTS EXPOSITION INVITATIONS

Executives of Creole Petroleum Corp., world's largest oil-producing company, receive special invitations to the International Petroleum Exposition in Tulsa May 15-22 from Dr. Oscar B. Irizarry, chairman of the exposition invitation committee and editor of Petroleo Interamericano, Latin American affiliate of The Oil and Gas Journal. Receiving the invitations in Caracas are: M. S. Kendrick, producing member of the management committee; Guillermo Zuloaga, manager of the geology department; Siro Vazquez, assistant production manager; and A. T. Proudfit, president. Irizarry is at right. The Petroleo Interamericano editor left the United States in September for a 20,000-mile, 3-month tour of 12 Latin American countries. During the trip he is serving as official representative and ambassador-at-large for the exposition in addition to his work in connection with his publication



These two Sovfoto pictures show Russian oil operations. Left, one of the wells, at Yelshanky in the Saratov region, which supply the new Saratov-Moscow natural-gas pipe-line system. Right, a gusher which came in during development of the Yelshanky region

Indigenous Production in Russia Insufficient to Meet Demands

by Warren W. Burns

IF daily consumption of petroleum products within Soviet Russia reaches 900,000 bbl. by 1950, indigenous production still will be 200,000 bbl. daily short of meeting demand.

Well-informed sources point out out that 900,000 bbl. daily demand by 1950 seems to be a reasonable expectation based on prewar trends, as well as the Soviet's expressed plans for mass production of oil-consuming road transportation facilities and a mass production of mechanized agricultural equipment. Moreover, it seems to correlate with Russia's postwar plans for constructing new highways and improving and extending existing highways.

Last year Stalin announced that 60,000,000 tons annually was the target—but that it might take two or three 5-year plans to achieve this goal. Some oil men understood this to mean that the Soviet's crude-oil production by 1960 would be about 1,200,000 bbl. daily, approximately double that country's prewar output.

Baku Area a Mainstay

Despite the vast territory for oil exploration available to Russia since private property was confiscated over 25 years ago, the Russians apparently have relied on the richness of the various areas of Apsheron Peninsula, which includes the famous Baku fields, to uphold the credit of the various 5-year plans when other regions failed to meet the quotas.

However, frequent reports of Russian methods indicate a major effort is being made to increase indigenous production. One result has been removal of oil-production equipment from satellite countries such as Hungary, Romania, and part of Austria.

In June of this year the Baku region celebrated its seventy-sixth anniversary as a commercial oil-producing region. Of the aggregate total production to date of all regions in Russia, amounting to less than 6 billion barrels, the Apsheron Peninsula has contributed about 4 billion barrels. The implication is that the Apsheron Peninsula has passed its peak. The outmoded method of producing wells on an open-flow basis, as practiced by Russian petroleum engineers for many years — and as still practiced in many Russian and Russian-dominated oil areas—has depleted a substantial part of the flowing life of one of the world's richest oil regions.

Secondary Recovery Necessary

The last well information available for analysis is for the first half of 1940. The figures show that a vast number of wells in the Baku region were shut in awaiting air lift, gas lift, or pumping. Furthermore, more than 1,000 wells were then being exploited by means of secondary-recovery methods. There is good reason to believe that the output of a large number of wells was lost during the late war and when they are placed on secondary recovery will produce at substantially lower rates than heretofore.

Another indication that the Soviet realizes Baku has passed its peak is the Moscow announcement that Baku is to be outmatched as an oil port by Makhach-Kala. This town is

on the Caspian Sea, northwest of Baku and some 90 miles east of Grozny, and presumably is to be turned into Russia's largest oil harbor.

This change indicates oil from Grozny will no longer move through the North Caucasian pipe line to the Black Sea port of Tuapse or to the industrial centers of the Ukraine but will move eastward through Makhach-Kala and up the Volga to the interior. Though the fields of the Apsheron Peninsula undoubtedly have passed their peak, they are expected to continue to contribute the largest quantity of Russian crude oil for at least another 10 years.

The Iranian Concession

In relation to the Caspian Sea and the north Iranian oil concession (which has been frequently referred to as an accomplished fact), the Russians are still active with behind-the-door diplomacy in hopes the Iranian Parliament will ratify the agreement which was negotiated last year while Soviet troops were still in Iran and which was thus in direct opposition to previous agreements entered into by Russia, Britain and the United States. The previous agreement was that none of these three countries could negotiate for a concession while foreign troops remained in Iran.

Figures Show War Damage

Damage to the fields in Maikop and Grozny is revealed by comparison of the production figures for 1930-1940 with those of 1945. In 1939 the production from these two important areas was about 100,000 bbl. daily. The Maikop region was producing 50,000 bbl. daily in 1939 and in 1945 only 2,000 bbl. daily. Grozny with 45,000 bbl. daily, yielded only 26,000 bbl. in 1945.

No official program estimates have been made for the northern Caucasian regions, but it has been assumed that the output of the area will be slightly under the prewar output or around 93,000 bbl. daily by 1950. The decline in importance of the Caucasus producing sector is shown by its drop in position from 89 per cent in 1939 to about 61 per cent in 1950.

Soviet planners apparently still have great hopes for the "Second Baku" area. In 1939-1940 it produced 33,000 bbl. daily and contributed about 6 per cent of Russia's total output. In 1945 it produced 57,000 bbl. daily or 15 per cent of the country's output. By 1950 crude-oil production from this region will average about 200,000 bbl. daily or 250 per cent more than was produced in 1945, it has been estimated. Furthermore, the area is expected to contribute more than 28 per cent of the country's output or about double its position in 1945.

Little is known about the over-all potentialities of the area. The 5-year war period might not be a reliable index of this area's future, but it would seem that as Russia expanded the industrial region between the Volga River and the Ural Mountains, to one of the largest regions in the Soviet Union, that they would, at the same time, have endeavored to expand the petroleum industry of the region if its potentialities were as great as the Soviets claim.

U. S. Aid Furnished

No estimates of production during the war years are available, the Russians continuing to refuse an exchange of information. However, the plight of the Russian petroleum industry during that period must have been desperate despite lend-lease given by the United States.

This aid included not only about 15,000,000 bbl. of petroleum products, valued at well over $100,000,000, but also valuable refining equipment which could be bought only with the expenditure of upwards of $43,000,000, as well as other unspecified oil-field machinery and materials. Furthermore, it will be remembered that the Soviets took a substantial quantity of oil-field equipment from Romania and the other nearby oil regions in countries which they invaded.

Russia Resuming Oil Trade

After years of aloofness from the international market, the Soviet Union is slowly beginning to revive its petroleum export trade. This is evidenced in recently announced plans to send petroleum products to Great Britiain. However, such trade is generally admitted to be primarily a means to obtain foreign credit. *(The Oil and Gas Journal, June 14, page 75).*

Russian oil products are also being shipped to Italy, and trade agreements have been made with Sweden and Denmark. The reestablishment of former oil-trade contacts with other countries in western Europe are expected shortly, but whether these contacts will be limited to the European satellites of Russia is not yet known.

Russia's oil exports have been of relatively small volume so far and probably will continue to be in the near future, but the political significance of these foreign oil shipments may have considerable effect.

First indications of Russia's willingness to part with some of her badly needed oil products came late last year in connection with the trade agreements with Sweden and Denmark. Sweden was promised 100,000 tons (about 700,000 bbl.) to be delivered during 1947, which, in part, would be an exchange for the large quantities of engineering materials and equipment supplied Russia by Sweden.

International

The Danish-Russian trade agreement, signed last November, involving an exchange of goods valued over $25,000,000, also stipulated that the supply of petroleum products by the Soviet would total about 30,000 tons (approximately 210,000 bbl.) during 1947.

Regarding Great Britain, the resumption of Russian oil shipments came as a result of the change in import arrangements. Heretofore, Britain's requirements were handled centrally, but as of June 1 the constituent members of the Petroleum Board have had to purchase their own supplies. And under the new arrangement the Soviet-owned Russian Oil Products, Ltd., which has a share in the British market, has become responsible for providing the supplies previously bought from other sources.

Russian Oil for Italy

Italy is among the latest countries to commence receiving oil from Russia. A recently concluded deal between the governments of the two countries covers an initial supply to Italy of 35,000 tons (245,000 bbl.), including 25,000 tons (175,000 bbl.) of kerosine, the remainder being principally gas oil. Delivery is to be made in Russian tankers.

All these Russian oil transactions still amount to only a very small percentage of Europe's present and constantly growing needs. Nor does there appear to be much scope for a relatively large expansion of Russia's oil exports in the near future, considering the country's own pressing needs and the progress made in restoring domestic production to prewar levels.

Russia's oil export trade steadily declined during prewar years, owing to an ever increasing domestic demand which, even then, Russian oil production was unable to meet. In 1938 only about 800,000 tons (5,600,000 bbl.) of petroleum products were sold abroad, out of an estimated domestic production of 29,700,000 tons (207,900,000 bbl.), against a record export figure of over 6,100,000 tons (42,700,000 bbl., from an output of 21,400,000 tons (149,800,000 bbl.)

While the entry of Russia into European oil trade may aid slightly in meeting product demands, the Soviet continues to lift certain quantities of products for seasonal needs in Siberia, from the United States. Last year, United States oil imports to Russia were approximately 400,000 tons (2,800,000 bbl.) This would indicate Russia has a two-way interest —economic as well as political—in international oil trade.

Here's another job

This job is one that drillers alone can't handle. It's going to take the combined efforts of every one of us in the petroleum industry . . . right from the man on the rig to the youngster who polishes windshields at the corner service station.

We've got a selling job to do . . . all of us . . . selling the petroleum industry to the very people who depend on it. Americans have come to accept their way of life as a matter of course, just as they have come to accept

to sink your teeth into

the developments of the future as inevitable. The average person seldom considers who or what is behind a good share of America's progress. That leaves the industry wide open to the kind of negative thinking fostered by false conceptions and misinformation.

We all know the part petroleum has played in the progress of our country and the contributions that have been made both in war and in peace. We know the sound basis upon which the industry operates. We know the competitive spirit that keeps things moving, that opens new wells, that develops new products, that makes best use of the nation's resources, that brings better living to us all.

Sure...we know...but there are millions who don't know. When people outside of the industry know it as well as we do, there'll be no question about the future. There's no better time than *now* to start telling them. There's no better time to sink your teeth into this selling job.

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WASHINGTON WATCHING

BY HENRY D. RALPH

An Over Optimistic Industry

WASHINGTON.—Observers who sat with the National Petroleum Council last week were surprised that members studiously avoided discussion of what to them seems the most serious problem confronting the entire oil industry—the shortage of supplies in the face of increasing demands.

Only B. L. Majewski, Deep Rock Oil Corp., mentioned the subject, and his proposal to do something about it was ruled out of discussion on parliamentary grounds. Heads of companies known to be facing desperate supply situations preferred to talk about other things.

To government officials it looks as though the oil industry is sitting on a volcano that is certain to erupt in a couple of months. Virtually everyone expects that the demand for heating oils this winter will be some 20 per cent higher than last year, yet the industry is entering the winter with stocks far below the levels of last fall. The heavy gasoline demand of last summer was met without as much difficulty as some had anticipated, but at the expense of production of fuel oil. Now refinery yields of middle distillates are below normal for this time of year, refinery runs and use of transportation facilities are at their ceilings, and it appears a shortage of tankers will bring an additional hazard to East Coast suppliers.

No Basis for Optimism

In view of all this the government men can see no basis for the oil industry's apparent optimism. They foresee many cold homes and closed factories throughout the entire northeastern quarter of the United States. They also foresee the oil industry getting a terrific black eye from the public—and many congressional investigations and proposals for drastic government control. In their view the industry should have been issuing loud warnings these many months, advising against installation of new burners, preaching product conservation, and convincing distributors that their allocations will be curtailed. In addition to this public-relations work it is felt the industry could do more toward meeting the problem without running afoul of the antitrust laws, such as working out customer-rationing plans, reducing gasoline yields, and trading products.

One observer remarked that the steel shortage alibi won't be good much longer; the oil industry can't pass the buck to the steel industry, or the export license system, or anywhere else if its customers are freezing. He predicts that if oil-company executives can't fill all fuel demands when the thermometer drops they had better be prepared to spend most of the winter before congressional committees.

Military Supply Outlook

THE optimism over the military petroleum supply situation expressed by the National Petroleum Council is not shared by the government officials concerned with actual procurement. They admit that the over-all figures show reasonably good coverage of immediate needs except for Navy diesel and heavy fuel oil, but contend these figures fail to tell the whole story.

Even with the products which are better than 90 per cent covered by offers, the available supplies are not always in the areas where the military wants to use them, so transportation facilities will be required to get them to the places needed. It is true that the industry has been able to supply much more gasoline, both motor and aviation, than the armed forces had thought last spring that they would require, but in doing this the industry neglected to fill orders for heavier products, and the requirements for these products have increased only 1 per cent above the original estimates.

Moreover, fuel oils of all grades are in shortest supply throughout the country, and if refiners could not meet military requirements during the summer months, officials wonder how they can make up the deficit now that the heating season has begun. Much of the increased demand for gasoline was caused by stepped-up training programs, which conceivably could be cut back again if absolutely necessary, but the Navy's fuel requirements are considered to be irreducible in view of our foreign commitments.

Outlook Seen as Dark

However well the figures may look for the current half of the fiscal year, the outlook for the second half is dark from any angle. The NPC committe report rather glossed over the second half, implying that this bridge would be crossed when reached, but the facts are that many major products are less than 30 per cent covered by offers, and for a period when supplies of all products are expected to be shorter than ever.

Much trust is placed in the Government's request that all the larger refiners make voluntary setasides for the government. So far there have been no refusals, though many refinery officials have come to Washington shaking their heads and explaining how tough this is going to be on their civilian customers. On the other hand, government procurement agents have not noticed any heartening increase in the volume of bidding since the voluntary quotas were assigned the refineries.

An Unfinished Fight

OPPONENTS of steel exports, particularly for the Trans-Arabian pipe line, have not given up their fight, and plan to turn to Congress for legislative aid.

Last week one of their champions, Sen. Kenneth S. Wherry (Rep., Neb.), called top administration officials before his small-business committee in secret session to explain why an export license was granted for 20,000 tons of pipe during this quarter to start work on the Arabian line. He did not state whether or not the explanation satisfied him, but he indicated that the subject of steel exports is not closed.

Independent domestic oil producers and other steel users are not at all satisfied. The official explanation, as relayed by Wherry, was that development of Arabian oil is in the national interest of the United States and the export license was granted for strategic, economic, and political reasons. The officials insisted that the license was well within the requirements of the export-control law, but domestic oil men believe that not sufficient attention was paid to the provision of the law requiring that exports must not affect the domestic economy adversely.

The present export control law expires next February 28, and undoubtedly the administration will ask that it be renewed as a means of implementing the Marshall plan. Domestic steel users can be counted on to try to make the new law much tighter, so as to restrict exports more drastically. Ironically, when the law was up for renewal last summer the Independent Petroleum Association of America opposed it on the ground that export licenses encouraged rather than restricted exports. Had their view prevailed there would be no restrictions whatever on shipments for the Arabian pipe line.

Tanker Shortage Relief

THE world tanker situation has suddenly changed from one of surplus to a condition of scarcity, and the White House has ordered 96 more tankers into service.

For many months the Maritime Commission has been reconditioning and selling a few of its surplus tankers and oil companies have been saying they were not interested in buying many because they had enough for all anticipated demands. Now the demands for tankers have increased so rapidly, both for domestic and foreign services, that an interdepartmental government committee on tankers has been created, headed by Capt. Granville Conway, the president's coordinator of emergency export programs.

After several meetings with the industry this committee has ordered these three steps: (1) The Navy will recondition 26 Mission type (extra speed) T-2 tankers to be operated by private companies for Navy account. (2) The Maritime Commission will recondition 24 militarized T-2 tankers from the laidup fleet for operation by the commission. (3) Forty-six laidup T-2 tankers will be sold to foreign operators.

The hitch in this program is that most of these tankers need extensive repairs and remodeling to remove gun platforms and other military features, and many shipyards have been tied up by strikes or have big backlogs of orders for other reasons.

Higher Freight Costs

ALL rail freight rates on petroleum and petroleum products went up 10 per cent this week by authority of an emergency order of the Interstate Commerce Commission. The flat increase was general for all commodities except coal, coke, and iron ore, for which special rates were set.

The increases were estimated to yield the railroads $700,000,000 a year, which the ICC found is necessary to meet increased operating costs. Still pending is an application of the railroads for further increases in rates running from 28 to 38 per cent in different regions, but with specific limits on increased charges for shipping petroleum and petroleum products in tank cars. Hearings on this application will be held by the ICC during the coming months, and a decision is expected late in the winter.

In such blanket rate increases there is usually special treatment for various commodities, including petroleum because of pipe-line competition. In its emergency order the ICC made no mention of petroleum, presumably because the increase was found necessary to maintain railroad revenues and because specific increases on petroleum will be considered in the forthcoming case.

J. A. KRUG B. BREWSTER JENNINGS BRUCE K. BROWN

Eight General-Session Speakers To Highlight A.P.I. Program

EIGHT prominent speakers headed by Secretary of Interior J. A. Krug will highlight the three general sessions of the twenty-seventh annual meeting of the American Petroleum Institute to be held in the Stevens Hotel, Chicago, November 10-13.

The speakers, besides Krug, and their subjects are: William R. Boyd, Jr., Institute president who will make his annual address; B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., "The International Petroleum Situation;" Bruce K. Brown, president of Pan American Petroleum Corp., "Petroleum and Its Relation to National Defense;" Hiram M. Dow, chairman of the Interstate Oil Compact Commission, "The Conservation of Oil and Gas;" Walter S. Hallanan, president of Plymouth Oil Co. and of the National Petroleum Council, "Solving Petroleum-Industry Problems;" John M. Lovejoy, president of Seaboard Oil Co., "Petroleum-Industry Public Relations;" and Henry J. Taylor, author, journalist, economist, radio commentator, "Looking Ahead at Home and Abroad."

12 Group Sessions

Twelve group sessions will be held in addition to the three general sessions and will include reports covering every phase of the industry, according to the preliminary program. More than 100 meetings of committees and subcommittees have been scheduled so far for the 4-day event.

Registration will open Monday, November 10, in the foyer of the Grand Ball Room of the Stevens Hotel and for those attending transportation meetings a registration desk will be provided on the third floor of the Palmer House.

Special accommodations for members attending the meeting will be provided by railroad companies. The M-K-T and Frisco are setting up an A.P.I. Special to accommodate members leaving from Houston, San Antonio, Austin, Fort Worth, Wichita Falls, and other Texas points where members may make direct connections. This train leaves Dallas at 4:15 p.m. Saturday, November 8; it arrives in St. Louis 8:30 a.m., November 9; in Chicago 2:10 p.m. November 9. A special Santa Fe train will leave Tulsa for Chicago at 5 p.m. Sunday, November 9.

The 25-Year Club is scheduled to hold its eighth annual dinner at the Casino Club, Tuesday evening, November 11, and the Pipe Liners Club will hold a dinner in the Ball Room of the Blackstone Hotel, Monday evening, November 10.

Preliminary Program

The preliminary program, exclusive of committee meetings, follows. (All sessions listed in Stevens Hotel unless otherwise noted):

MONDAY, NOVEMBER 10

Group session, 10:00 a.m.—Symposium on evaluation and testing of cracking catalysts. Sponsored by the committee on analytical research papers, the following subjects are now under consideration and the speakers will be announced later: "A Plant-Control Test for Particle Size of Fluid Cracking Catalyst;" "Modification in the Roller Analysis for Determination of Particle-Size Distribution;" "Accurate Particle-Size Determination of Fluid Catalysts by Coordination of Roller Analysis and Microscopic Examination;" "Prediction of the Activity of Cracking Catalysts from Heat of Wetting;" "The Rapid Estimation of Surface Area of Cracking Catalysts by the Aromatic Adsorption Method;" "Relative Values of Aromatic Adsorption Indices and D+L Activity Tests;" "Simplified Method for Determination of Carbonaceous Deposits on Cracking Catalysts."

Group session, Agricultural, 10:00 a.m.—

(Continued on page 193)

Industry Leaders Concerned Over East Coast Supply Outlook

by Warren W. Burns

FOLLOWING a prediction by M. J. Rathbone, president of Standard Oil Co. of New Jersey, that this winter's fuel-oil situation in the Midwest and along the Atlantic Seaboard "will be touch-and-go for the next 6 months," an official of another major oil company in New York said he was "certain" that fuel oil rationing will be evoked — for the East anyway — before next spring.

This official said the exact date for fuel oil rationing (not merely on an allocation basis) will depend largely on when the Army and Navy make known their demands for greater petroleum supplies, from aviation gasoline to bunker oil.

B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., disclosed only a few days previously that his company is bringing in three tankers, each with a capacity of 115,000 bbl. of Middle East crude oil to the Paulsboro (New Jersey) refinery to ease the situation here. *(For further details, see page 84).*

In an address, October 15 before the National Association of Purchasing Agents in Milwaukee, A. J. McIntosh, Socony-Vacuum economist, blamed the war for limiting normal expansion of facilities in the petroleum industry and explained that new facilities take time, steel, and vast sums of money.

Admitting that there may be local shortages or spotty conditions in the fuel oil situation this winter, McIntosh said that this is because the industry is "running so close to capacity." More margin is needed, he explained, "and it is within the power of our people to provide this margin by conservation."

Commenting on next winter's fuel-oil demands and the probability of "a very tight situation on heavy fuels," Rathbone said that "the margin is just a little too narrow to give any of us assurance that regional or temporary spot shortages will not occur." The Jersey Standard official spoke before the fall meeting of the Empire State Petroleum Association in New York.

The Midwest is in a difficult position, he explained, because crude production there fell off in recent years and also because the additional pipe lines to bring crude to refineries in that area have not been completed. The Eastern Seaboard is somewhat more fortunate, he added, but refineries there won't continue to run at top capacities unless additional tankers are made available.

The petroleum industry is now "entering the most difficult period we anticipate for some time to come," Rathbone said. "Our stock position—and I refer to the over-all national picture—is not too comfortable." Estimates of product storage as of October 1, normally the start of the heating season, places it at nearly 5,000,000 bbl. under last year's level at the same time. He continued:

ICC Demand Estimates

"Estimates of the Interstate Compact Commission place the anticipated level of demands for all oils from October 1, 1947, to March 31, 1948, at a figure in excess of 6 per cent over the corresponding figure for last year. And this added demand must be met with very little in the way of new equipment or facilities available in any of the important branches of the industry. It is obvious to you, I am sure, that with this weak stock position, very little flexibility is present in meeting upward demand."

To meet this winter's demands, the Jersey Standard president said, crude-oil production and refinery runs must be maintained at approximately 5,170,000 bbl. daily. This means that production must be 384,000 bbl. more daily and runs to stills about 409,000 bbl. more daily than produced and charged last year.

A. L. Nickerson, director in charge of domestic marketing, Socony-Vacuum, told the E.S.P.A. audience that "some form of ratable allocation of our available petroleum supplies appears inevitable" this winter. And because of the federal Government's increased gasoline requirements, such a program undoubtedly would include gasolines as well as heating oils. Moreover, current tight supply won't be solved with coming of spring, Nickerson predicted.

Nickerson explained that although 96 additional tankers are being made available it will be two or three months before their effect is shown.

It is felt, he said, that East and Gulf Coast refiners will have to produce yields of kerosine and distillate combined of 29.3 per cent in fourth quarter of this year and 30.6 per cent in first quarter of 1948. A yield of only 26.2 per cent was produced in third quarter.

"This is an extremely important point," he said, "and must be watched with the greatest care. In terms of distillates alone, East Coast refineries must produce a yield of almost 22 per cent in the fourth quarter and 23.8 per cent in first quarter of 1948."

WORLD'S FIRST PROPANE TANK SHIP CHRISTENED

Present at the christening ceremonies of the world's first propane tank ship, the S.S. "Natalie O. Warren," at Beaumont, Tex., October 11, were: Mrs. Howard Felt, matron of honor; Howard Felt, vice president in charge of the liquefied petroleum gas division, Warren Petroleum Corp.; Craig Cullinan, president, American Republics Corp.; Mrs. Cullinan; W. K. Warren, president of Warren Petroleum Corp. and its subsidiary, Warren Maritime Corp.; Mrs. W. K. Warren, who christened the ship and for whom it was named; L. B. Coppinger, president of Pennsylvania Shipyards, Inc., which constructed the ship; Mrs. J. A. LaFortune, matron of honor; and J. A. LaFortune, executive vice president of Warren Petroleum Corp. The former Maritime Commission dry-cargo vessel was converted to a 33,000-bbl. propane tank ship by the installation of special tanks. (Details on the ship were in The Oil and Gas Journal, October 11, page 50)

C. N. G. A.'s Annual Fall Meeting Attracts 800 Attendance

by Herndon David

LOS ANGELES.—Nearly 800 members and guests of the California Natural Gasoline Association gathered at the Ambassador Hotel in Los Angeles October 10 for the twenty-second annual fall meeting. Featured were an address by F. J. Colton, Tide Water Associated Oil Co., and five technical papers.

During the morning session two papers were presented. These were "Fuel and Energy Outlook in the West" by Marion E. Dice, manager, economics department, General Petroleum Corp., and "Centrifugal Compressor Installation at the Seeligson Project" by Dan T. McDonald, chief process engineer, natural-gas department, Magnolia Petroleum Co.

Dice gave a broad analysis of trends and discussed near-term prospects and the long-range outlook. "There is no shortage of reserves in the West at present," said Dice, "nor is there any in prospect for the near future. The main problem confronting engineers today is how to recover efficiently and economically the large percentage of oil left in reservoirs after primary production methods cease to be commercial. Price is one solution to the recovery of a small portion of this oil. Many wells currently could not have been produced commercially at prices prevailing at the end of the war. Price alone, however, is not the solution. Advanced secondary methods must be developed if reserves in the West are to be kept at a balanced figure with the current rate of withdrawal."

McDonald described the installation of centrifugal compressors at a jointly owned gasoline plant now being constructed in Seeligson field of South Texas. He also presented comparative installation and operating costs between reciprocating and centrifugal compressors. "The conclusions which are drawn from the specific case of the centrifugal compressor installation at Seeligson," stated McDonald, "are as follows:

"1. The investment cost for the centrifugals will be approximately 21 per cent less than for the reciprocators. Although the comparison is not for identical compression ratios, it is believed that the reciprocators were not penalized.

"2. The centrifugals will cost 17 per cent less in terms of annual net operating and maintenance expenses.

"3. The centrifugals used more fuel and auxiliary utilities than would an equivalent reciprocator installation. The relative value would change with compression ratio and specific reciprocator cylinder efficiency.

"4. The turbine-driven centrifugals are quite flexible, particularly in flush gas compression service where volumes and pressures are not stabilized.

"5. No generalization should be made from this comparison. Each specific installation must be evaluated to determine the optimum machinery type and size."

Opening the afternoon session R. S. Ridgeway introduced F. J. Colton, C.N.G.A. president, who spoke briefly concerning the history, growth, and future of the organization.

First paper presented during the afternoon was "Significance of Fuel Sensitivity in the Performance of Motor Gasolines" by E. J. McLaughlin, supervisor of engine fuels division, and J. A. Miller, research engineer, California Research Corp. This paper, presented by McLaughlin, discussed the significance of the laboratory octane ratings on the performance of motor fuels on the road.

Roy M. Bauer, gas supply supervisor, Southern California Gas Co., presented a paper, "Current Review of Natural-Gas Supply for California."

The final paper was "Cycling at High Pressures vs. Depletion and Cycling at Low Pressures" by E. O. Bennett, consulting engineer. The paper dealt with the recently advanced idea that condensate-type reservoirs can be produced just as efficiently, and perhaps more economically, if the reservoir pressure is allowed to decline to a very low level before cycling operations are started.

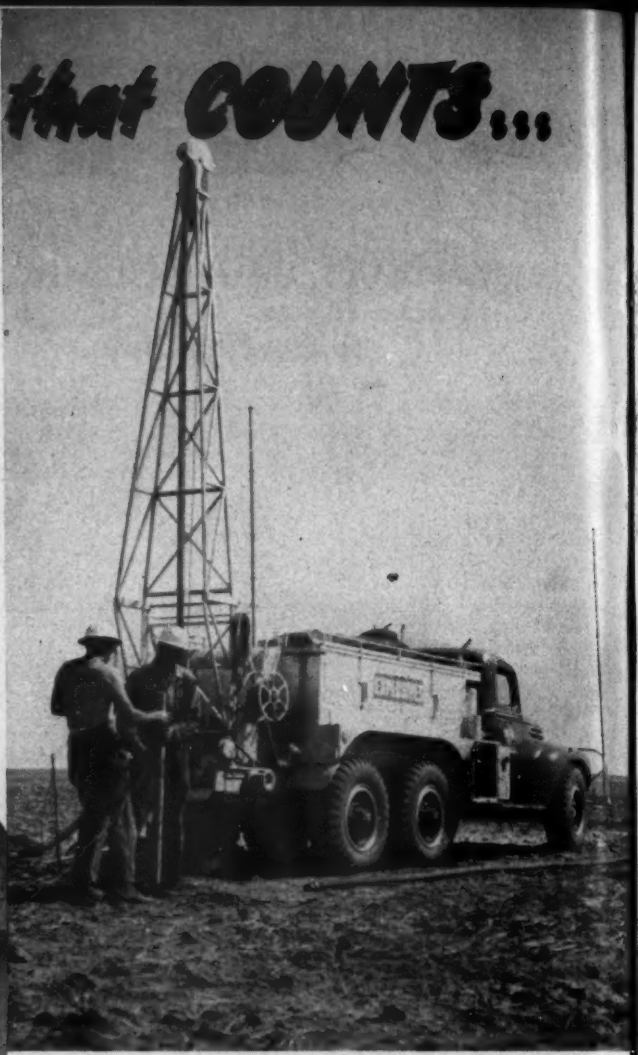
The meeting was arranged by a committee under the chairmanship of R. S. Ridgeway, Standard Oil Co. of California. Members included M. L. Arnold, Richfield Oil Corp.; Paul Armstrong, sales engineer; Ira Bechtold, The Fluor Corp.; W. J. Heinz, Ingersoll-Rand Co..; M. W. Kibre, General Petroleum Corp. Randal Maass, General Petroleum Corp.; and George L. Tyler, duPont de Nemours, chemical division.

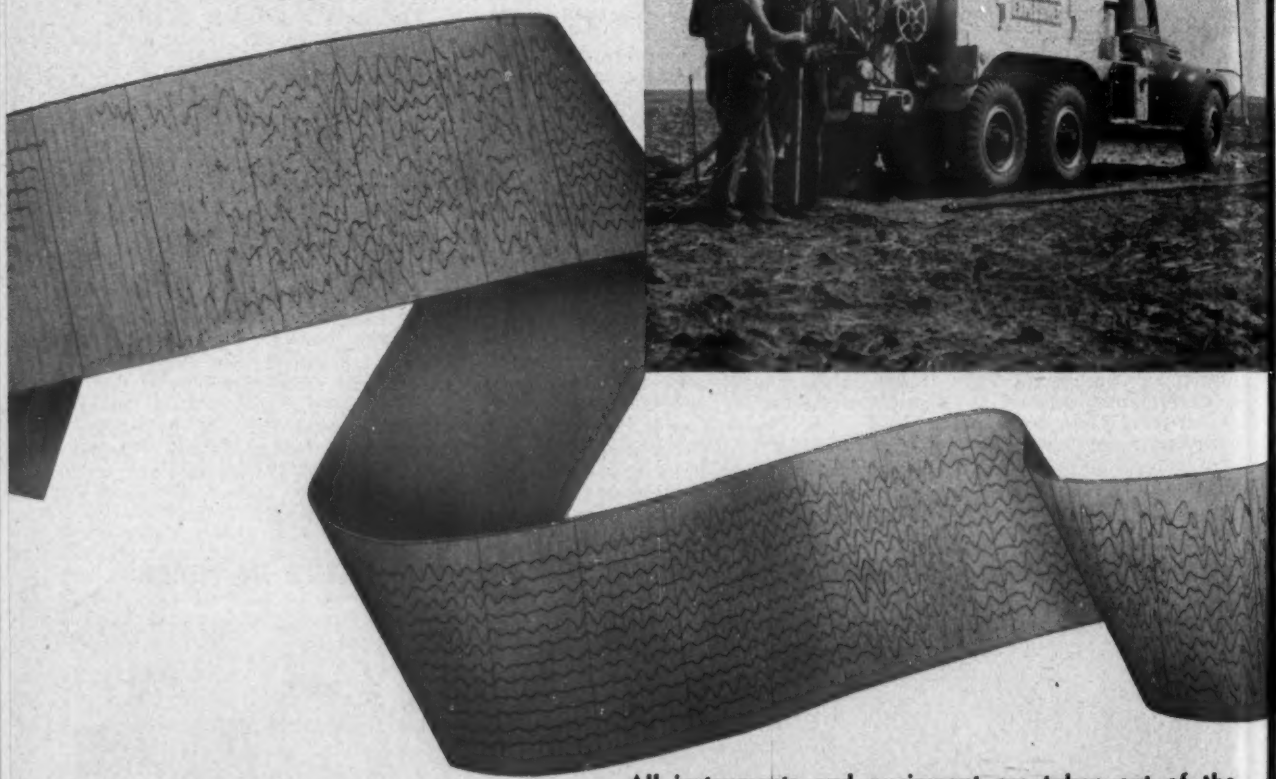
A.I.M.E. PETROLEUM DIVISION EXECUTIVE COMMITTEE MEETS IN TULSA

Photo of the Petroleum Division executive committee, American Institute of Mining and Metallurgical Engineers, at the windup of the Tulsa fall meeting, October 10. This gathering was a record-breaking affair, with about 625 registered plus many other visitors. Above are Paul Fitzgerald, Dowell Incorporated; Benjamin Craft, Louisiana State University; John H. Murrell, DeGolyer & MacNaughton; I. W. Alcorn, Pure Oil Co. (1948 chairman-elect); Dr. J. B. Umpleby, consulting geologist; Max Ball (prominent visitor at meeting), director of Oil and Gas Division, U. S. Department of Interior; Stuart E. Buckley, Humble Oil & Refining Co.; Howard C. Pyle (1947 chairman), Bank of America; Herbert F. Beardmore, Barnsdall Oil Co.; Lloyd E. Elkins (general chairman for the Tulsa meeting), Stanolind Oil & Gas Co.; William H. Strang, executive secretary, A.I.M.E. petroleum division; W. B. Berwald, Ohio Oil Co.

It's the RECORD that COUNTS...

During the war years, and for a period thereafter, shortages of critical materials forced SSC, as well as many other businesses, to extend the operating life of field instruments and equipment beyond that for normal times. In that emergency period, these field units rendered satisfactory service; however, when controls were lifted and materials again became available, SSC as rapidly as possible modernized or replaced all sub-standard units. Every SSC crew has now been provided with the most modern equipment.





All instruments and equipment are taken out of the field periodically and either reconditioned or replaced whenever they fail to meet the standards set by SSC. Modernizations developed and tested by SSC's Research and Development Division are constantly being incorporated in the field units. Seismograph Service Corporation's continued and sustained efforts to improve its facilities for conducting seismic surveys assure its clients the highest standard of exploration.

PERSONALS

Hatch Named Aramco Manufacturing Manager

R. S. HATCH, who has just been appointed manager of manufacturing and processing for Arabian American Oil Co., has been in the oil business since July 5, 1927, when he went to work for The Texas Co. in the refining department, terminal division, New York.

Hatch was graduated from the Massachusetts Institute of Technology in June 1927 with a degree in civil engineering. A native of Boston, he is 43 years of age.

Just 18 days after joining Texaco Hatch was transferred to the company's engineering department at Port Arthur, Tex. In 1930 he moved again, this time to Norfolk, Va., to the sales department, and shortly after this he was made a construction engineer. In 1931 he was transferred back to New York to the refining-engineering department and returned to Port Arthur in 1933 as the assistant to the assistant general superintendent of refining.

In July 1938 Hatch again returned to New York to assume new duties with the purchasing department, being assigned as assistant to the manager. In 1939 he was named assistant to the manager of Texaco's purchasing department and in 1943 became the assistant manager. In 1946 he was promoted to manager.

During the war Hatch served as chairman of the materials subcommittee for the District 1 Petroleum Industry Committee.

L. E. Barrows, former manager of domestic production for The Texas Co. in Houston, and **R. C. Stewart,** formerly a division producing manager, recently visited in Bogota, Colombia. Both men are retired.

Dwight F. Benton, general manager of lubricating sales, Standard Oil Co. (Ind.), Chicago, has been elected a director of the National Lubricating Grease Institute to fill the unexpired terms of **L. C. Welch** who recently retired.

Floyd E. Warterfield, Jr., president, Oklahoma Engineering Co., recently flew to Cartagena, Colombia, for several weeks of consulting work in connection with operations of the Andean National Pipe Line Co.

Edwin J. Jennings, Jr., Abilene, Tex., has been awarded the annual scholarship award of the American Petroleum Institute's Houston chapter as an outstanding junior engineering student at Rice. The award is based on both scholarship and extracurricular activities. Jennings served in the Army Air Forces for about 3½ years. During the summer of 1947 he worked in the production and research department of Humble Oil & Refining Co.

Jack E. Clark, superintendent at Riverton, Wyo., for Noble Drilling Corp., has been placed in charge of company operations in Rangely field.

Cmdr. Andrew J. Smith, U.S.N., has been relieved as deputy area petroleum officer on the staff of the Caribbean Defense Command, Quarry Heights, Canal Zone, and assigned to duty as subarea petroleum officer on the staff of the commander, Service Force, Atlantic Fleet. Smith's headquarters will be in London where he will be attached to the staff of the commander, U.S. Naval Forces, Eastern Atlantic and Mediterranean.

George F. Wagoner, exploration manager for Carter Oil Co.'s southern division, was named president of the newly formed Ark-La-Tex Geophysical Society, which held its first meeting in Shreveport last week. **R. M. Wilson,** geologist, Ohio Oil Co., is vice president, and **J. R. Walker,** chief geophysicist, Arkansas Fuel Oil Co., secretary-treasurer. Bylaws and a constitution for the society are to be drawn up by a committee composed of **L. F. Fischer,** Sohio Petroleum Co.; **H. M. Buchner,** Carter Oil Co.; **Carl Howard** and **Carl L. Bryan,** Union Producing Co.

J. L. Latimer, president, Magnolia Petroleum Co., Dallas, headed a group of visting Socony-Vacuum Oil Co., Inc., officials making a 2-day inspection trip of Permian Basin fields. The New York executives continued to Beaumont, Tex., where they participated in a meeting of the manufacturing representatives from the refineries of Socony-Vacuum and affiliates. The visiting officials included: **John C. Case,** vice president in charge of production and director; **Wilbur F. Burt,** vice president in charge of manufacturing; **C. F. Beaty,** executive in charge of industrial relations and director; **Robert Seigel,** president, Socony-Vacuum Oil Co. of South America, in charge of operations in Venezuela; and **Fred Bartlett,** assistant to Case.

Eugene C. Hermann, cost coordinator of New Jersey Works of Standard Oil Co. of New Jersey, has been named assistant department head of the chemical-products division at the Bayway (New Jersey) refinery. A graduate of Massachusetts Institute of Technology, Hermann joined the company at the Baton Rouge (Louisiana) research laboratory in 1927.

H. F. BEARDMORE

Herbert F. Beardmore, chief engineer, Barnsdall Oil Co., Tulsa, is joining Warren Oil Co., Houston, effective November 1. **W. L. Horner,** head of secondary - recovery operations for Barnsdall, will become Barnsdall's chief engineer upon Beardmore's departure. Secondary-recovery operations and engineering will be combined into one department at that time.

H. F. Sinclair, president of Sinclair Oil Corp., has been awarded the rank of Grand Officer of the Order of Vasco Nunez de Balboa. **Dr. Jorge E. Boyd,** Panamanian delegate to the United Nations, conferred the decoration. Sinclair Panama Oil Corp., in which Cities Service Co. is an equal partner, is engaged in oil-development operations in Panama.

Wilbur M. Neely, general manager at Great Bend, Kans., for the Dale G. Ives Interests, oil producers in

PERSONALS

Barton and Ellsworth counties, Kansas, has moved to Wichita where the organization has opened new offices.

© Bachrach
R. M. MORRISON

R. M. Morrison, former general purchasing agent of The Texas Co., has been appointed manager of the purchasing department, succeeding **R. S. Hatch** who goes to Arabian American Oil Co. **Philip Hauck** takes over Morrison's duties. **W. G. Taylor** replaces Hauck as divisional purchasing agent, Chicago, and **F. G. Schlemmer,** Los Angeles, becomes northern divisional purchasing agent in New York, succeeding Taylor.

E. L. Earl, former chief geologist for Crown Central Petroleum Corp., has resigned to accept the position of division geologist for British-American Oil Producing Co., Houston.

W. H. Farrand, manager (operations), foreign producing department of The Texas Co., and **W. S. Olsen,** supervising geologist in the same department in the New York office, recently were in Bogota, Colombia, on a business trip.

William L. Daoust, Lansing, is the new chief of the Oil and Gas Section of the Michigan Conservation Department. He succeeds the late F. R. Frye. Daoust, who is 46, joined the department in 1924, was in charge of the section's Muskegon office 3 years and of the Mount Pleasant office from 1931 to 1939. Since then he has supervised field officers, was overseer for drilling, spacing, producing, and plugging operations.

C. L. Herold, district geologist in southern Louisiana for Shell Oil Co., Inc., has been transferred to the regional staff as a representative for the New Orleans area. He was replaced by **A. C. Elliott,** formerly geologist in charge of the Houston district, and **W. L. Grossman** has been named head of the Houston district. Other recent assignments in Shell's exploration department include: **F. A. Nelson,** senior geologist, regional staff to represent the Tulsa area; **E. C. Taber,** former geologist on the regional staff, to senior geologist in the Oklahoma City division of the Tulsa area; **James E. Wilson,** regional staff member, to district geologist in charge of the Wichita Falls district in the Tulsa area; and **H. E. Rankin,** formerly senior geologist in charge of the Oklahoma City division, to head of the Central district.

William H. Winfield has been named manager of the recently established department of economic research for Monsanto Chemical Co.

Carl E. Moses, former Gulf Coast division geologist for Phillips Petroleum Co., has sold his interest in Inland Producers, Inc., and will join **David R. Stewart** with offices in Mattoon, Ill.

T. J. Skrabanek, former assistant manager of the general division of the industrial and commercial gas department for Lone Star Gas Co., has been appointed assistant superintendent of compressor stations. Skrabanek has been with the company since joining in 1928 as industrial engineer.

Herman M. Siems, formerly senior engineering assistant in Standard Oil Co. of New Jersey Bayonne refinery's operations analysis department, has been appointed foreman of gaging and inspection in that department.

Wallace E. Pratt, former vice president of Standard Oil Co. (N. J.) and a past president of the American Association of Petroleum Geologists, has been named by the American Institute of Mining and Metallurgical Engineers to receive the Anthony F. Lucas Petroleum Gold Medal for "distinguished achievement in improving the technique and practice of finding and producing petroleum." He will be presented the award at the annual meeting of the institute February 1948 in New York. Pratt, who was the first recipient of the Sidney Powers Memorial Award of the American Association of Petroleum Geologists, is an internationally known geologist and the author of "Oil in the Earth," besides more than 50 scientific papers and other writings. As a geologist for the Philippine Government Bureau of Science and later with the East Asiatic Petroleum Co., Pratt has had extensive foreign experience in the geological field. He spent some time in Mexico and Costa Rica for The Texas Co. in 1915. In 1918 he joined Humble Oil & Refining Co., Houston, as chief geologist. In 1924 he became director and in 1933 vice president of Humble. He was elected to the executive committee of Standard Oil Co. (N. J.) in 1937.

E. H. Powers, geologist for Gulf Oil Corp., Fort Worth, has been named zone geologist at Midland, Tex., succeeding **William J. Hilseweck,** who recently resigned to become chief geologist for Republic Natural Gas Co., Dallas.

Frank W. Bell, senior district geologist for Shell Oil Co., Inc., at Sacramento, has been promoted to senior division geologist and transferred to Bakersfield, Calif. Other recent promotions and transfers in Shell's exploration department on the West Coast include: **Donald E. Greenlee,** geologist, Bakersfield to Ventura; **Robert V. Payne** party manager; **Frank Anderson,** and **Albert C. Eckerle,** seismograph operators; **Clifford Jarman,** junior seismologist, and **James F. Lowe** and **Thomas J. Watson,** computers, all from Sacramento to Washington.

William S. Bissell, engineer in Shell's production department, pipeline division, at the Los Angeles office, has been promoted to division engineer. Other changes in the production department include: **Farren B. Jensen,** assistant superintendent to superintendent, pipe-line division, Los Angeles office; **Lee S. Osborne,** division exploitation engineer at Bakersfield, to division manager, Calgary, Alta.; **Wesley R. Kinney,** senior exploitation engineer, Oilfields to Bakersfield; **Albert L. Hearld,** assistant engineer, Long Beach to Bakersfield; and **Fielding R. Vogan,** assistant engineer, Long Beach to Bakersfield.

Richard N. Burnley, senior technologist in Shell's manufacturing department in San Francisco, has been promoted to assistant department manager in thermal cracking at Wilmington refinery.

R. B. Hanning, acting assistant chief chemist with Shell Chemical Corp. at Torrance, Calif., has been promoted to assistant department manager in Houston, and **S. F. Konzen,** general foreman, Houston, has been promoted to acting master mechanic. Recent transfers with Shell Chemical include: **J. F. Self,** chemist, Torrance to Houston; **C. L. Hedman,** senior engineer, San Francisco to Houston; **L. C. Norton,** chemist, Torrance to Houston; **Thomas James,** chemist, Shell Point to Martinez, Calif.; and **C. T. Dybal** and **O. D. Walraven,** junior chemists, Torrance to Houston.

F. A. Bush, chief geologist for Sinclair Oil Corp., New York, recently toured the Rocky Mountain area.

D. R. Snow, vice president, Barnsdall Oil Co., addressed the company's district engineers during their annual meeting October 8-10 in Tulsa. District engineers in attendance included: **G. E. McClachey,** Jennings, La.; **Earle Lougee,** Victoria, Tex.; **H. A. Scott,** Barnsdall, Okla.; **C. R. Lyles,** Oxford, Kans., and **Keith Lindley,** Hope, Ark.

George Acuff, formerly Rocky Mountain superintendent for Kerr-McGee Oil Industries, Inc., has joined **B. F. Allison** of Cut Bank, Mont., to form the Acuff-Allison Drilling Co.

Phil K. Cochran, assistant division superintendent for Carter Oil Co. at Shreveport, has resigned to join Palmer Oil Co., Wichita, in its Shreveport office. Cochran had been with Carter over 24 years.

M. D. Hughes, petroleum engineer for Long Beach Oil Development Co., Long Beach, Calif., has been hired by the Long Beach Harbor board to serve as chief petroleum engineer.

Roger H. Decker has completed work for his Ph.D. degree in organic chemistry at the State College of Washington and has joined the research and development department of Tide Water Associated Oil Co., San Francisco.

Norman Hardy, president of Richmond Petroleum Co. of Colombia, recently left Colombia for a business trip to San Francisco. His route took him through Venezuela. **M. E. Hoover,** the company's general manager, has returned after a vacation in the United States.

Arthur B. deLaski, assistant to the manager of mechanical, steam, and power operations in the New Jersey Works, Standard Oil Co. of New Jersey, has been named supervisor of the newly created service department.

SHIFTS—

James C. Craig, superintendent, Continental Oil Co., Fullerton, Calif., to Oklahoma City; **Lawrence W. Coldren,** superintendent, Pure Oil Co., Nacogdoches to San Angelo, Tex.; **J. R. Latimer, Jr.,** engineer, Humble Oil & Refining Co., Beaumont to Tomball, Tex.; **Jack E. Fulgham,** chemist, Sinclair Refining Co., Fort Worth to Jennings, La.; **C. S. Johnson,** foreman, The Texas Co., Kermit to Seminole, Tex.

Robert L. Carroll, engineer, Humble Oil & Refining Co., McCamey, Tex., to Columbia, Miss.; **F. R. Lovering,** superintendent, Shell Oil Co., Inc., Odessa to Midland, Tex.; **W. H. Wiginton,** superintendent, Atlantic Refining Co., Odessa to Greggton, Tex.; **H. L. Hoover,** foreman, The Texas Co., Port Arthur to Freeport, Tex.; **James F. Jungi,** engineer, Gulf Oil Corp., Port Arthur, Tex., to Philadelphia, Pa.; **V. R. Lay,** superintendent, N. W. Wheless Drilling Co., Ruston, La., to Kaufman, Tex.

Ray V. Hennen, geologist, Hiawatha Oil & Gas Co., Shreveport to Midland, Tex.; **Ross M. Acher,** foreman, The Texas Co., Farina, Ill., to Seminole, Okla.; **Marion E. Parrack,** foreman, Duwe & Farris Drilling Co., Holyrood to Hoisington, Kans.; **C. R. Inglis,** engineer, Cities Service Oil Co., Great Bend to Chase, Kans.; **William E. Harrelson,** superintendent, Rocky Mountain Drilling Co., Lyman to Rock Springs, Wyo.; **Jack H. Walters,** engineer, Sohio Petroleum Co., Oklahoma City to Pauls Valley.

B. F. Burke, engineer, Carter Oil Co., Pauls Valley to Seminole, Okla.; **Conrad C. Dye,** engineer, Stanolind Oil & Gas Co., Tulsa, to Woodsboro, Tex.; **C. W. Underwood,** engineer, Sun Oil Co., Odessa to Premont, Tex.; **Jacque L. Williams,** engineer, Humble Oil & Refining Co., New Orleans to Fayette, Miss.

Harold L. Kemm, engineer, Socony-Vacuum Oil Co., Inc., National Park to Paulsboro, N. J.; **Dewey J. Sabin,** engineer, Standard Oil Co. of Ohio, Cleveland, Ohio, to Oklahoma City; **George L. Yates,** engineer, Standard Oil Co. of Ohio, Cleveland, Ohio, to Oklahoma City; **C. M. Ross,** geologist, Amerada Petroleum Corp., Roosevelt, Utah, to Aztec, N. M.

DEATHS

J. L. Lucey, 73, chairman of the board of Lucey Petroleum Co., Dallas, died October 8 in Boston. He was widely known in the oil industry and in 1930 he represented the oil industry at a presidential conference on the nation's business. He has been associated with oil development for 46 years. After participating in the Alaskan gold rush, Lucey went to Texas where he organized a drilling company. He then went to California where he was credited with introducing rotary drilling commercially. He opened fields in Mexico, Argentina, India, Romania, Russia, and other countries. Chief producing properties of Lucey Petroleum Co. are in the East Texas and Corpus Christi areas, with interests also in Louisiana, Arkansas, and Mississippi. Lucey resigned as president of the company last week and was made chairman of the board. He was president of the Republican Club of Texas and former president of J. F. Lucey Co., Los Angeles; Lucey Manufacturing Co., New York; Federal Home Loan Bank, Little Rock, Ark.; Talco Asphalt & Refining Co. and Talco Pipe Line Co., Mount Pleasant, Tex.

William E. Nolan, 55, who had worked in California, South America, and Texas as a driller and tool dresser, died September 29 in Kermit, Tex.

Tim Healy, former Dallas operator who entered the oil business in 1920 when he came to the United States from Australia, died October 12 in Fort Worth.

Charles F. Schwab, 78, oil producer and former mayor of Bradford, died October 11 in Bradford.

Herbert Waltz, foreman for Shell Oil Co., Inc., died October 7 in Legion, Tex. Waltz had been with the Shell company for 12 years and previously worked for Galena Signal Oil Co.

Alvin C. Jackson, who had been active in the formation of independent oil companies and was chairman of the board of several companies, with offices in Sistersville, W. Va., died October 3, 1947, in Jamestown, N. Y.

Patrick J. McGrath, 83, former assistant mechanical superintendent of the Bayway refinery of Standard Oil Co. of New Jersey, died October 8 in Elizabeth, N. J.

William F. Hammett, 89, early-day Oklahoma oil operator, died October 7 in Tulsa.

Jacob Elkins, 90, who was active in the oil and brokerage business until his retirement 8 years ago, died October 8 in Tulsa.

Thomas C. Wilson, 56, land department official, Gulf Oil Corp., Tulsa, with which he had been associated since the early 1900's, died October 9 in Tulsa.

A. G. Bussman, 61, of Wickwire Spencer steel division of Colorado Fuel & Iron Corp., died October 7 in New York.

P. L. Griffiths, 62, vice president, treasurer, and a director of Ethyl Corp., died October 4 in New York.

John D. Fletcher, 57, chief of sales personnel for Sinclair Refining Co., died October 5 in Battle Creek, Mich.

Robert H. Smith, 60, retired superintendent of the Houston terminal of the Gulf Oil Corp., died October 4 in Houston.

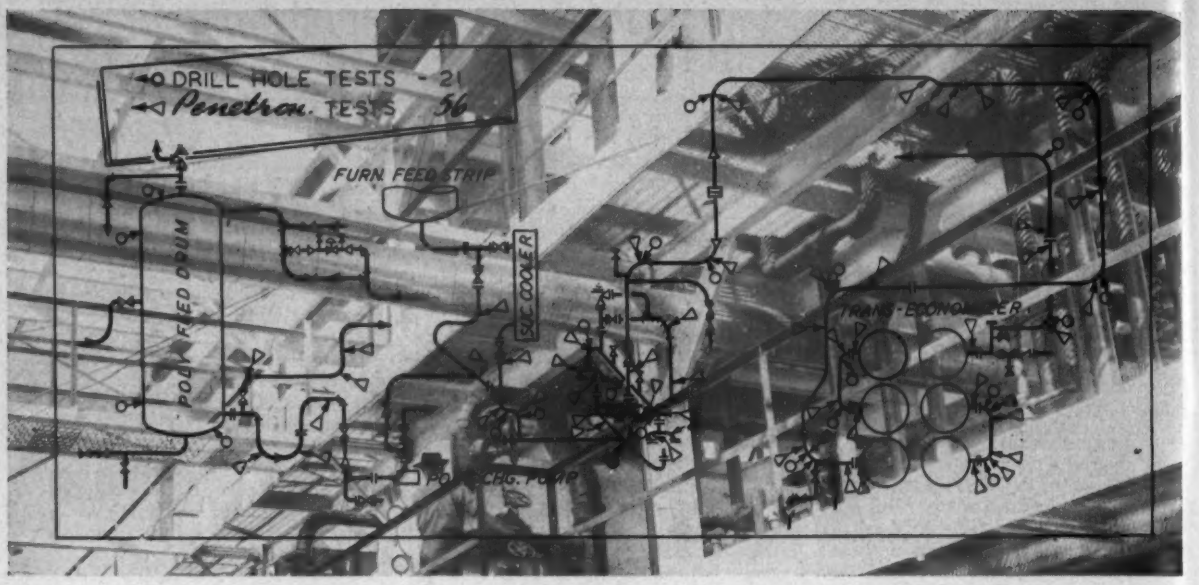
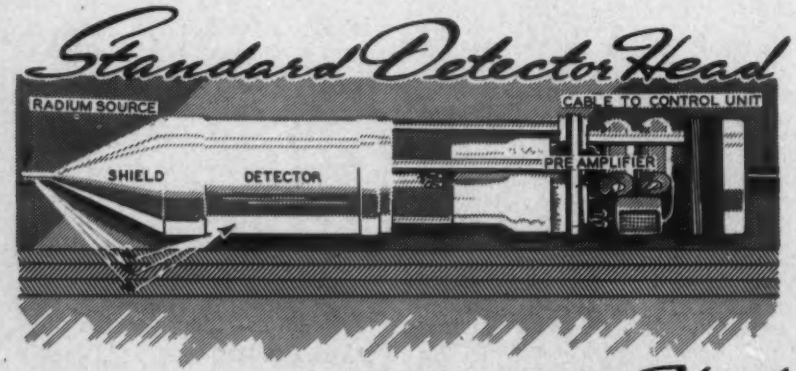


Fig. 1—The background of this illustration gives some representation of the maze of important inspection and check points which exist in any refinery. The diagram itself is a part of the piping and processing equipment on a poly unit at Continental's Lake Charles refinery. The former inspection program of drilling test holes is shown by small circles (21 locations). Under the new Penetron testing program 56 spots—2½ times as many as formerly—are being nondestructively checked at 6-month inspection intervals. This example is fairly representative; however, the ratio of Penetron to drill tests could just as easily be 10 to 1

Gamma Ray and SUPERSONIC



Equipment-Inspection Methods Used in Continental Oil's 8 Refineries

by Leigh S. McCaslin

POSTWAR developments in the refinery-equipment inspection field have practically eliminated old-time inspection methods in the eight plants of Continental Oil Co. The hammer and drill testing of the past are making way for such instruments as the Penetron and the Audigage.

These new instruments determine, nondestructively, the thickness of a material, and it is necessary to have access to only one side of the material. In other words, it is no longer necessary to dismantle equipment for visual inspection or to drill test holes and mechanically caliper pipe and equipment walls to accurately determine their thickness. Inspectors simply place an instrument on the outside of pipe walls, towers, tanks, drums, etc., and determine their

thickness quickly and easily—and with great accuracy.

As compared with the old hammer and drilling testing methods these new inspection methods are advantageous to the refinery operator in several ways:

1. The labor and disadvantages of drill testing are eliminated. Among the disadvantages are the possibilities of: poor welds, forgetting to plug a hole, and leaving a rough surface on the interior which will cause turbulence and thus shorten the life of the pipe or vessel.

2. It is possible to test more spots on high-temperature and high-pressure piping in process plants.

3. Some units, such as light-oil and lube units, which previously were only hammer tested, are now accurately measured. (Previously it was not considered that the corrosion problem in these units was sufficiently critical to warrant drill testing. However, with the new nondestructive testing methods it is deemed good practice to take some thickness readings.)

4. Storage tanks can be given a complete and fairly quick check while full of fluid.

5. If necessary, units can be tested while still in operation.

6. Spots previously not suspected of corrosion, and hence not checked, can be checked quickly. (A number of bad places have been found in this manner.)

The Penetron, which utilizes gamma rays in its operation, is used by Continental for measuring thicknesses up to approximately ¾ in. On the other hand, the Audigage, a mechanical resonance instrument, is used for thicknesses above ¾ in. Thus, the two instruments supplement each other in their application.

Continental's Use of Penetron

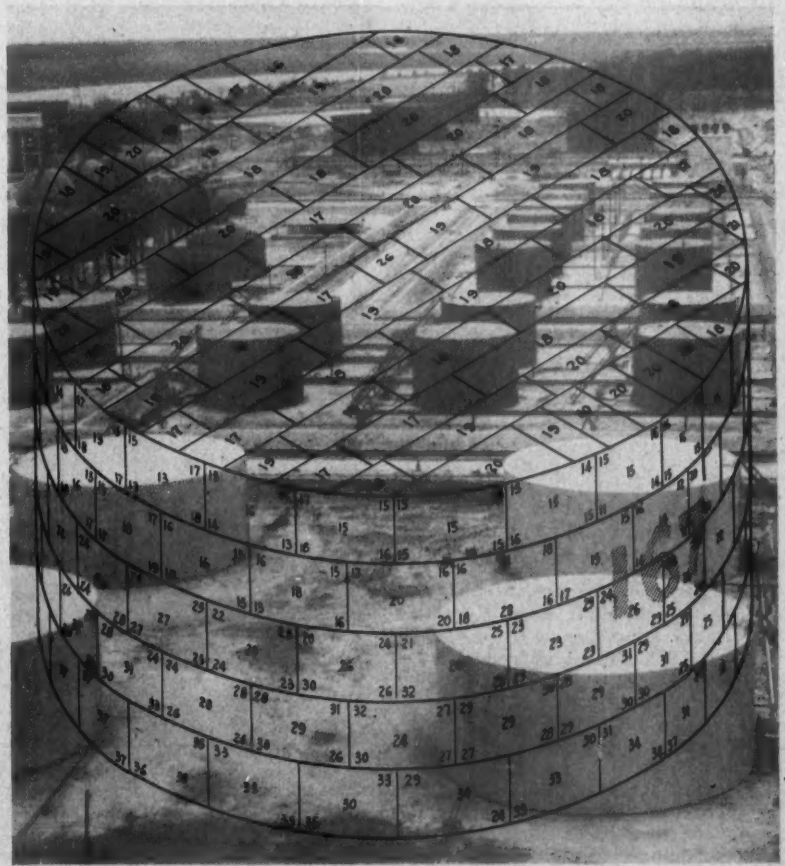
As described by W. D. Spillman, chief inspector, and N. K. Edwards, inspector, Continental was "sold" on the Penetron by a demonstration over a year ago. On the day prior to the demonstration, the inspection department had tested an elbow on an 8-in. suction line which ran to a hot-oil pump on a cracking unit. The test had been performed in a routine manner by drill testing and showed the elbow to have a thickness of 0.34 in. During the demonstration of the Penetron, the instrument indicated a thickness of only 0.30 in. in one spot on the elbow. To test this reading, the inspection department drill tested at that spot and verified the 0.30-in. reading. The original drill test of 0.34 in. had been a correct reading, but the spot tested had not been the thinnest section in the elbow. The inspectors reasoned that such a condition could very possibly exist in other critical lines and that the Penetron by virtue of the fact that any number of spots could be checked nondestructively was more likely to find the weak places. It is obviously impractical to drill test an elbow in five or six places each inspection.

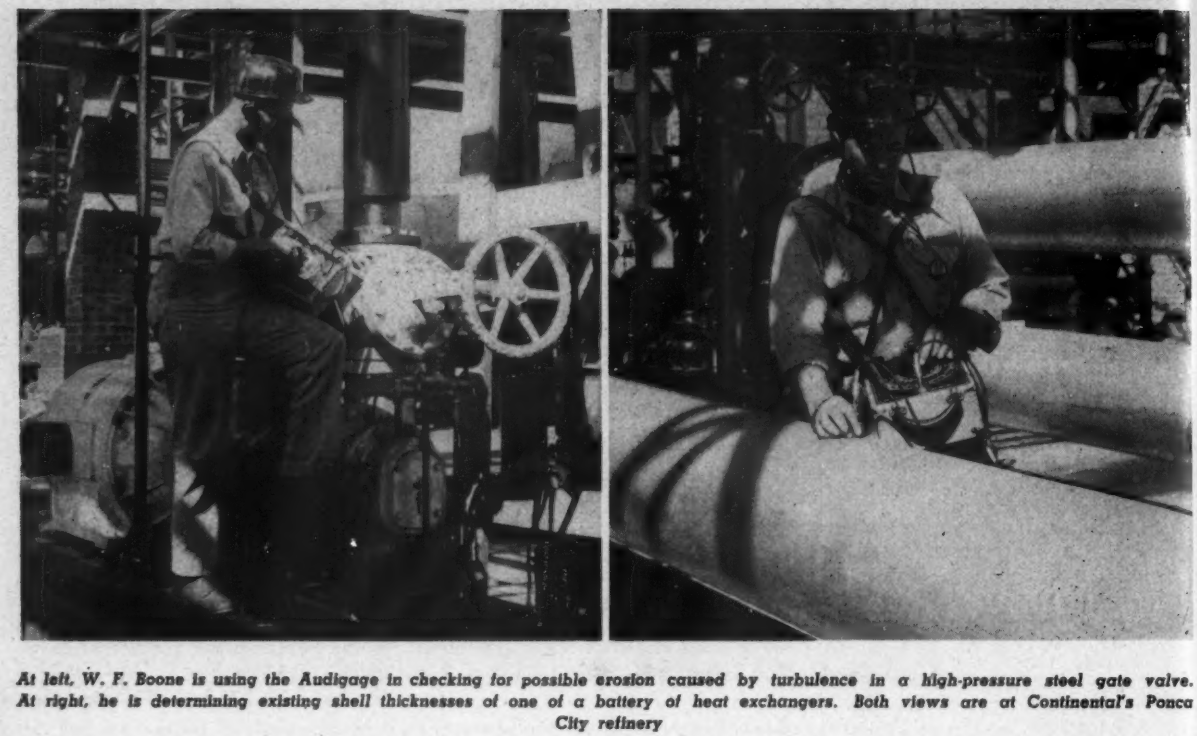
Convinced by this demonstration, Continental purchased a Penetron for its inspection department and has since added a second instrument to provide adequate inspection of its eight refineries. As a general observation, Penetron takes as much or perhaps a little more of the time of their inspectors than the old mechanical calipering. However, this is more than offset by the advantages listed in the third paragraph of this article.

Fig. 2—The Audigage instrument uses a supersonic resonance principle in determining material thicknesses

For each phase of their inspection of a refinery, Continental has a diagram of the piping and equipment inspected upon which they mark the thicknesses determined. Since switching from the old inspection methods to the Penetron the number of thicknesses recorded has at least doubled

Fig. 3—Background of this illustration gives some representation of the immense task that would be involved in checking dangerously-corroded tank plates in any large storage installation. The black line drawing shows the 401 thickness tests (figures are 0.01 in.) made by Penetron in 1 day. These data are for a 25,000-bbl. crude-oil storage tank at Ponca City. To drill test in adequate fashion virtually any sizable tank would be impractical





At left, W. F. Boone is using the Audigage in checking for possible erosion caused by turbulence in a high-pressure steel gate valve. At right, he is determining existing shell thicknesses of one of a battery of heat exchangers. Both views are at Continental's Ponca City refinery

in most instances. A graphic example of this can be seen in Fig. 1. The diagram is of piping on a poly unit at Lake Charles, La. The piping consists of suction and discharge lines from a furnace charge pump to a poly-feed surge drum. In the first inspection, the thicknesses were determined by drill testing and 21 of them were recorded. Six months later the Penetron was available and the drawing shows the results of testing with the Penetron. A total of 56, or over twice as many readings, were made. The beneficial results of these additional reading are obvious. Better maintenance and safer working conditions are sure to result.

Use for Tank Inspection

Aside from the inspection of high-temperature and high-pressure piping in process plants as exemplified by the poly-unit inspection discussed above, the second major use of the Penetron by Continental has been for checking the condition of tanks of all types. Storage tanks for oil, gasoline, chemicals, solvents, and gas have been checked to date.

An inspection made in August of a 25,000-bbl. crude-oil storage tank at the Ponca City farm is of particular interest. This tank was suspected to be in relatively poor condition and a test was considered necessary. To drill test all the plates in such a large tank would be impractical and visual inspection would be inadequate. However, with the Penetron it was possible to make a very thorough and complete check of the tank and without damaging it in any way.

The inspectors made five readings on all the shell plates with the exception of the bottom ring where three readings per plate were taken. As little corrosion damage was expected, the roof plates were tested in one spot only. A total of 401 spots was tested on the tank, giving a very complete picture of its conditions. The test was completed in 1 day. (See Fig. 3.)

As a check the Penetron measurements were proven by making a few drill tests adjacent to spots where Penetron readings were taken. Since the shell was badly pitted, the inspectors reported that the actual minimum thickness at the locations shown in the drawing is probably from 0.01 to 0.02 in. less than shown. This is because the Penetron measurements show the average thickness of a 1-sq. in. area.

The test results showed that, as suspected, the tank was in bad condition. The thicknesses required by the A.P.I. tank code for this particular tank are as follows:

Location—	Required thickness
Bottom ring, in.	0.375
Second ring, in.	0.3125
Third ring, in. min.	0.250
Fourth ring, in. min.	0.250
Fifth ring, in. min.	0.250

By referring to Fig. 3, it can be seen that none of the sheets in the two top rings and only a few in the middle ring are suitable for use. Most of the sheets in the two bottom rings are too thin for their present location, but could be used in third, fourth, and fifth rings. The roof was determined to be in good condition with thicknesses substantially the same as when the tank was new.

Miscellaneous Uses

A number of special uses have been made of the Penetron by Continental. For example, it has been used to find the liquid level in hydrofluoric acid tanks for inventory purposes. During inspections, plugged lines containing fluid have been found in short order. On one occasion, the refinery department assisted the gasoline department by checking all piping in the Walden, Colo., cycling plant for corrosion. The wells in the area produce CO_2 in considerable quantity and carbonic acid formed by the CO_2 and moisture creates a corrosion problem. At Wichita Falls, the Penetron was used to check evaporator lines while in use and at a temperature of 760° F.

Principle of the Penetron

The Penetron was invented by D. C. G. Hare, a physicist employed by Texaco Development Corp. Patents were first applied for in 1939. In its original form, Penetron was mounted on truck and trailer and weighed close to 400 lb. Dr. Gerhard Herzog, who was at that time engaged in research and measurement of cosmic rays with Dr. A. H. Compton, at University of Chicago, joined Texaco Development Corp. to engage in development and research on Penetron. His work not only increased the effectiveness of the instrument and brought into being many new applications, but also resulted in reducing

the size to an approximation of its present 24-lb. weight.*

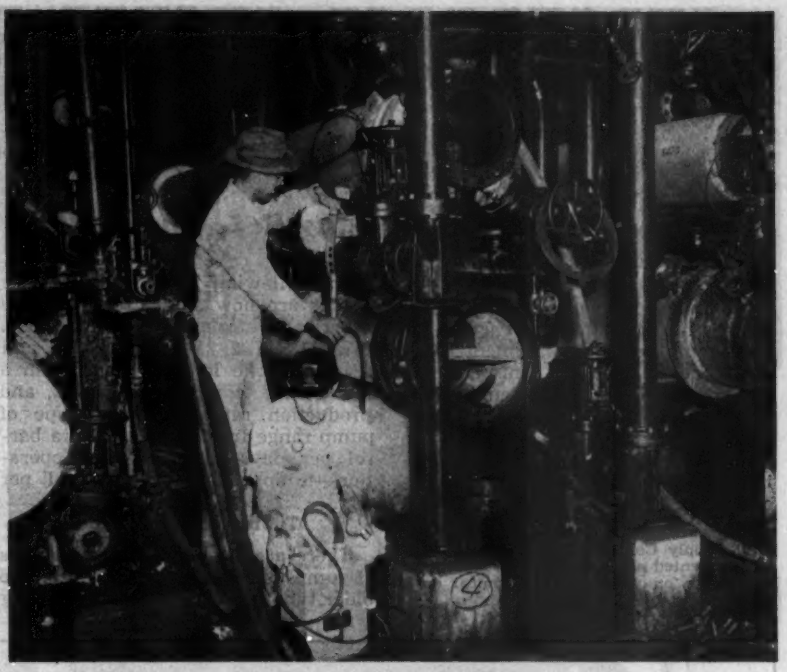
For its operation, the Penetron utilizes gamma rays which are produced by the disintegration of radium and due to their short wave length (.000001 micron approximately) pass more or less freely between the electrons and protons of the atom. Only when a collision occurs directly between those waves and the components of the atom is there any effect on the passage of the wave through the material. These gamma rays readily pass through many inches of steel, whereas a much thinner wall of lead, tungsten, or gold will stop or shield most of the radiation. When the gamma ray strikes a part of an atom, the ray loses part of its energy, and in so doing, causes a secondary gamma ray to be emitted. The secondary rays, having a much longer wave length (.000140 microns approximately) than the primary rays, do not have the penetrating power of the primary rays, but are discharged in all directions; some of these secondary rays, the number being dependent upon thickness and density, emerge from the material on the same side as the radiating source.

Utilizing this basic principle then, a source of gamma radiation (radium) and a detector properly shielded from the source, but exposed to the secondary or back-scattered rays, can be coupled with a Geiger-type counter to determine the number or amount of secondary rays, and it is then possible to calibrate the received back-scattered rays (with the aid of a standard or a given density) directly into the material thickness.

The Penetron consists of a control box and two types of measuring heads. One, the standard head, employs the back-scattered radiation emitted on the same side as the source of radiation and is diagrammatically illustrated (title page) where radium source S, isolated from the counter D by shield S.H., is placed against a material FE of unknown thickness. Gamma rays in penetrating the material create secondary or back-scattered radiation which emerges on the same side as the source, as illustrated by dotted lines. A certain number of these pass through a 1-in. square opening in the shielding and strike the detector.

Rays, on striking the detector set up minute electrical pulses which are amplified many thousands of times, integrated or averaged for accuracy, and cause a deflection on a meter. A curve previously prepared on graph paper by plotting meter readings against known thickness of material such as steel, makes it possible to read unknown thicknesses of steel by referring the meter readings to the curve. This reading will be correct within 5 per cent regardless of the molecular structure, heat treatment, or alloy content of the material being measured, according to the manufacturers. The reading obtained depends only on density and thickness.

*In 1945, Texaco licensed Engineering Laboratories, Inc., Tulsa, to manufacture and sell the instrument. In turn, United Engineers, Tulsa, headed by B. I. Dikmen, is authorized as a sales and service company for the Penetron. Oilfields Service Co., Long Beach, Calif., is Pacific Coast service representative.



A regular check team (replacing the previous drill-test group) handles Conoco's mechanical inspection. Here, Inspector Boone, standing, has the tangential head of the Penetron unit in position to check a 2-in. raffinate line to the furnace of a furfural unit. N. G. Edwards, kneeling, is recording the reading on the control unit

The standard head then, is best used to determine the thickness of a material which is flat or has a radius of curvature that is over 2 in. Due to the nature of secondary or back-scattered gamma rays, which are much less penetrating than primary gamma rays, approximately .7 of an inch of steel is the greatest thickness measurement that can be made; the back-scattered secondary radiation produced by steel in excess of .7 of an inch is absorbed, so that the curve flattens out. Consequently, readings on material much over this thickness will be meaningless.

Also if there is any material or liquid of high density adjacent to the far side of the material being measured, the reading will not follow the curve which was drawn when only air was present on the far side, as the material or liquid will also cause back-scattered radiation which will be read on the meter. However, a calibration curve with a known liquid or solid present behind known thicknesses of the material being measured can be drawn up. Then, by referring the readings taken to this curve, unknown thickness of material can be read.

With the standard head, the rays emerging from the sample being treated occupy 1 sq. in. and the readings of thickness will be the average thickness over 1 sq. in. of material. The Penetron does not detect small cracks as there is usually no loss of material, only separation. Detection of pin-point corrosion will depend on relative amount of material gone.

There are two holders available for the standard head—an inside holder provided with a small air-operated piston at each end and a holder with permanent magnets for either inside or outside measurements.

The standard head, utilizing back-scattered radiation, solves the problems for flat plate and measurements from the inside of tubes but leaves much to be desired when small-diameter pipe, reverse bends, elbows, and limited space make the proper placement of the head difficult or impossible. To overcome this difficulty the tangential head was developed. The measuring head does not depend on back-scattered radiation for its measurement, but rather on the amount of gamma-ray energy lost in traveling tangentially through a section of the wall. In this type of head, since primary gamma rays are used, their penetrating power greatly increases the thickness that may be measured. Sufficient radium source could be utilized to read through practically any thickness of material. However, the heads now in use are designed for reading thicknesses up to only .9 in.

(Continued on page 135)

SUBSURFACE SUCKER-ROD PUMPS

—Factors in their selection and use

by R. L. Chenault*

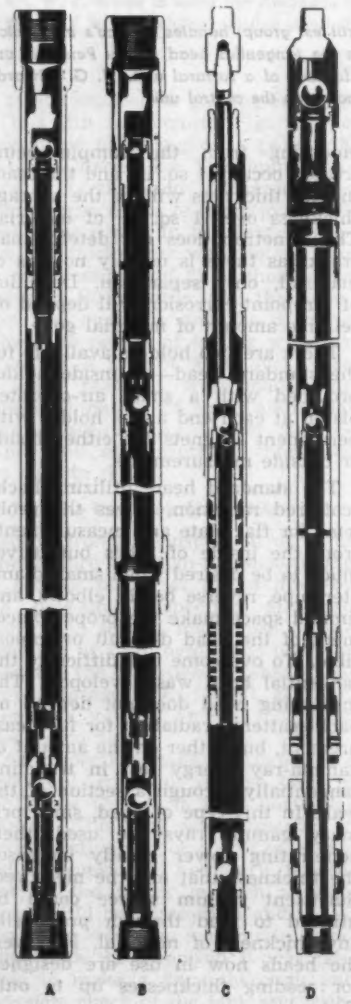
BORES of reciprocating oil-well pumps commonly range from 1 to 4¾ in. in diameter. The 4¾-in. bore pump has a displacement about 22½ times that of the 1-in. pump for a given speed and stroke length. This wide range of pump capacities is necessary to permit the selection of the most efficient and economical pumping equipment for all conditions encountered.

*Research and development engineer, Oil Well Supply Co., Oil City, Pa. This paper was presented at the A.S.M.E. 1947 national conference on petroleum mechanical engineering, October 5-8, Houston.

The following bores of subsurface pumps are now standardized by the American Petroleum Institute: 1, 1¼, 1¼, 1½, 1¾, 2, 2¼, 2½, 2¾, 3¾, and 4¾-in. Stroke lengths range from a few inches to more than 20 ft., and production rates with this type of pump range from a fraction of a barrel per day—with part-time operation—to approximately 3,000 bbl. per day.

Tubing and Rod Types

There are two broad classifications of pumps operated by sucker rods. The older type is now known as a "tubing pump." This term indicates that the pump barrel is attached directly to the tubing of a pumping well and lowered to the bottom of the well, or to any desired location for pumping, as the tubing is run into the well. The plunger, or traveling valve, of a tubing pump is run in on the lower end of the sucker rods until it contacts the lower valve, or "standing valve" assembly. The rods are then raised sufficiently to prevent bumping bottom at the end of the downstroke and connected to the pumping unit, or jack, at the surface. Typical tubing pump



Typical Pump Assemblies—Diagrams and Descriptions

Fig. 1 "A"—A cold-drawn working barrel with upper and lower couplings, and a standing-valve assembly which may be pulled with the sucker rods, if desired. The traveling valve consists of a simple four-cup assembly. Similar traveling valves are commonly equipped with from 4 to 12 cups.

Fig. 1 "B"—Tubing pump equipped with a metallic plunger, an extension nipple and an oversize standing valve. This assembly also is equipped with a closed cage, and ball and seat below the plunger. A closed cage valve attached to the bottom of the plunger is often referred to as a "gas valve" inasmuch as the clearance space is reduced with a valve at this point and the pump will handle gas with less danger of gas lock. It is desirable to permit a metallic plunger to stroke out both ends of the barrel a short distance to distribute wear over the entire length of the barrel. This permits the use of an oversize plunger in many cases, to compensate for barrel wear, and to reduce slippage, without the necessity for refinishing the barrel. The lower extension nipple in Fig. 1 "B" permits the plunger to stroke out the bottom of the barrel the desired amount without striking the standing valve.

Fig. 1 "C"—A stationary barrel, top-seating insert or rod-type pump equipped with cups and composition rings. A stationary barrel pump may be designed for top seating, as shown, or for bottom seating. Top seating is preferred wherever it is possible to use it, since this arrangement provides a seal just below the oil discharge from the pump to the tubing and prevents sand or other solid material from settling between the barrel and the tubing, thereby minimizing the chances of the pump becoming sanded in place so it cannot be pulled with the rods. Bottom seating is necessary if the rod pump is to be seated in a tubing pump barrel which still has the lower coupling in place, if the length of the rod-pump barrel is greater than that of the barrel used for seating. With bottom seating the pump barrel extends upward into the tubing and there is no circulation of well fluid around the outside of the barrel. For this reason, the pump is more likely to become sanded in place, and top seating is recommended wherever it can be used.

The stationary barrel pump (Fig. 1 "C") is fitted with a "sand check" which consists of a drop valve mounted in the cage of the valve-rod guide and loosely fitted around the valve rod. This drop rises on both the upstroke and the downstroke of the plunger, or traveling valve, to permit the discharge of well fluid. However, if the pump is shut down the drop rests on its seat and prevents suspended sand which settles to the bottom of the tubing from entering the pump barrel where it may cause the pump to jam when it is again started. A sand check is important in a pump of this type when used in wells producing appreciable quantities of sand. There is an unavoidable restriction above the pump barrel to provide for the seating device, and the valve rod, and any considerable quantity of sand would be extremely difficult to force through this restriction. It is pointed out that 0.1 per cent by volume of suspended sand in a 4,000-ft. well will result in a solid sand pack 4 ft. in length in the tubing, if all of the sand settles to bottom, or a much greater length pack if it is permitted to settle into the pump barrel, which necessarily is much smaller than the tubing. A sand pack of this type usually is dislodged from the tubing without difficulty by pumping fluid through it for a period of time, but if it is permitted to settle into the pump barrel it has to be removed on the first stroke, if at all, and the pump is very likely to jam.

Fig. 1 "D"—Traveling-barrel type of rod pump fitted with a metallic plunger. This type of pump is necessarily bottom seating but it is not as susceptible to sanding in place as is the stationary barrel pump with bottom seating because there is a continual surging of well fluid in and out of the lower end of the barrel, while in operation, and sand cannot settle into the barrel when shut down. However, sand may settle below the barrel and prevent full travel on the downstroke.

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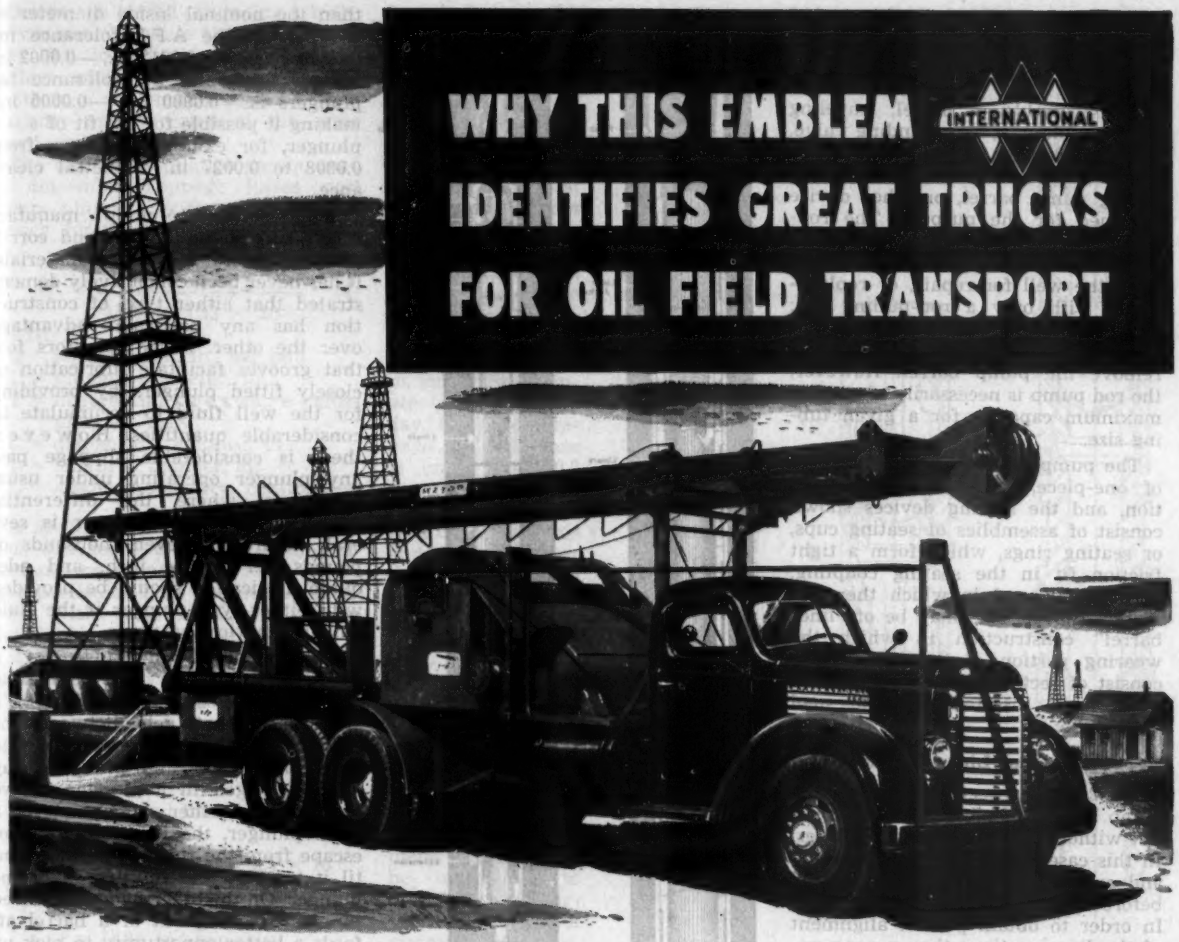

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assemblies are shown in Fig. 1, "A" and "B," and rod type, "C" and "D."

A more recent development is the "insert" or "rod" pump in which the entire assembly of barrel, traveling valve or plunger, and standing valve, is installed with the sucker rods and seated in a special seating nipple, a tubing pump barrel, or other device designed for the purpose. The rod-type pump has the obvious advantage that the entire pump may be removed from the well for repair, or replacement, with only a rod-pulling job; while, with a tubing pump it is necessary to pull both rods and tubing to remove the pump barrel. However, the rod pump is necessarily of smaller maximum capacity for a given tubing size.

The pumps shown in Fig. 1 are all of one-piece, "full-barrel" construction, and the seating devices shown consist of assemblies of seating cups, or seating rings, which form a tight friction fit in the seating coupling, nipple, or barrel in which they are seated. Barrels also may be of "liner barrel" construction in which the wearing portion of the barrel may consist of section liners, or of a one-piece liner, inserted into the steel outer tube.

Sectional Liner Pumps

Fig. 2 shows a sectional liner tubing pump barrel assembly with a plunger but without valves and other fittings. In this case the liners are 12 in. long and are accurately honed and faced before assembling in the steel jacket. In order to obtain perfect alignment of the liner sections they are assembled on an expanding mandrel before inserting into the jacket. The end collars are tightened while the mandrel is in place and the mandrel is then removed. The sectional liner method of barrel construction permits barrel of any desired length to be manufactured to a high degree of accuracy without excessive machining difficulties.

Fig. 3 shows a sectional-liner rod-pump assembly of the traveling-barrel type with a mechanical bottom-lock hold-down mandrel for holding the pump in position and forming a seal to prevent fluid leakage. A complete bottom-lock hold-down assembly consists of a mandrel, as shown in Fig. 3 and a special seating shoe which must be attached to the well tubing. A typical bottom-lock hold-down and shoe assembly is shown in Fig. 4.

The cup or ring-type hold-down is generally satisfactory for relatively shallow wells where bottom-hole temperatures are not excessively high, but the mechanical hold-down is preferred for wells more than 4,000 ft. in depth and where bottom-hole temperatures are above 150° F. Mechanical hold-downs for top-seating stationary-barrel rod pumps also are used to some extent at the present time and doubtless they will become more popular for deep-well applications.

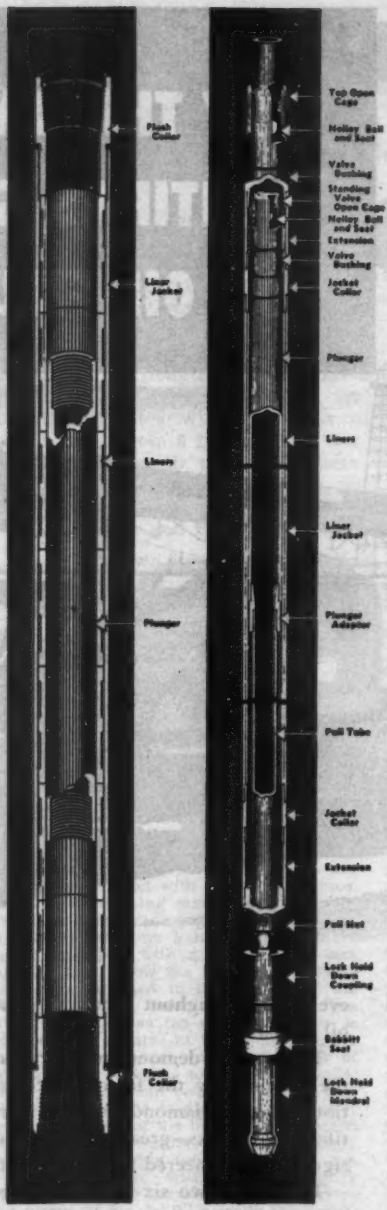


Fig. 2—(Left) Sectional liner tubing pump barrel with plunger. Fig. 3—(Right) Sectional liner traveling barrel rod pump assembly

Pumping Deep Wells

The high differential pressures encountered in pumping deep wells require an effective sealing or packing means on the traveling valve, or plunger. For wells of extreme depth a closely fitted metallic plunger is almost always used to form a satisfactory seal with the barrel. Such plungers are commonly supplied with clearances of 0.001, 0.003, or 0.005 in the barrel. Such plunger fits are commonly referred to as —1, —3, and —5 fits, meaning that the plunger is 0.001, 0.003, 0.005 in., etc., smaller than the nominal inside diameter of the barrel. The A.P.I. tolerance for liner barrels is +0.0012 in., —0.0002 in. for all sizes, and the tolerance for plungers is +0.0000 in., —0.0005 in., making it possible for the fit of a —1 plunger, for example, to vary from 0.0008 to 0.0027 in. diametral clearance.

Most subsurface-pump manufacturers furnish both plain and corrugated plungers in various materials. It has never been conclusively demonstrated that either type of construction has any particular advantage over the other. Many operators feel that grooves facilitate lubrication of closely fitted plungers by providing for the well fluid to accumulate in considerable quantities. However, there is considerable slippage past any plunger operating under usual conditions, where the differential pressure across the plunger is several hundred, or even thousands of pounds per square inch, and adequate lubrication should be provided with either type plunger if the fluid has any lubricating value.

One possible advantage of a grooved plunger is that any solid particle such as a sand grain or a steel chip, that gets between the plunger and the barrel and tends to score the barrel and plunger, may become lodged in a plunger groove and do no further damage. With a plain plunger, the particle could not escape from the finished surfaces until it traveled the full length of the plunger. On the other hand, a grooved plunger stroking out of a barrel affords a better opportunity to pick up solid material and carry it into the barrel.

Slippage Past Plungers

In considering slippage past a closely fitted plunger it is pointed out that for all practical cases under which a pump is used the flow between the plunger and the barrel is in the viscous range, so that leakage, or slippage, is inversely proportional to the absolute viscosity, and to the plunger length. It is directly proportional to the plunger diameter, the differential pressure between the two ends of the plunger, and the cube of the diametral clearance.

The absolute viscosity of well fluids commonly pumped will range from approximately 1 to 100 centipoises, at the temperature existing at the pump setting, and in some cases the viscosity may be as high as 1,000 centipoises. The slippage past the plunger of a particular plunger pump assembly with a given plunger fit, length, and diameter may vary by as much as 100 to 1 under fairly common conditions, and as much as 1,000 to 1 under extreme conditions, as a result of viscosity variations, with the same differential pressure across the plunger. Thus, it is seen that a plunger pump may operate with acceptable

efficiency in a well producing a highly viscous oil, while the same pump may fail to deliver any oil to the surface when installed at the same depth in a well producing oil of low viscosity and operated at the same speed and stroke.

The following equation can be used to determine slippage losses past pump plungers with sufficient accuracy for most purposes:

$$Q = \frac{\pi D P C^3}{U L \times 2.32 \times 10^{-7}} \quad (1)$$

where

Q = slippage loss, in.³ per min.
D = plunger diameter, in.
P = differential pressure across plunger, psi.
C = diametral clearance, in.
L = length of plunger, in.
U = absolute viscosity, centipoises

A specific application of this equation will serve to illustrate the importance of plunger fits for a pump of a particular bore and stroke operating with various plunger fits, in fluids of various viscosities.

If we assume a 2¼-in. bore pump operating with a pressure differential of 2,000 psi. between the two ends of a 48-in. plunger, at a rate of fifteen 48-in. strokes per minute, in oil having a viscosity of 3 centipoises and a diametral clearance of 0.003-in. between plunger and barrel, Equation 1 becomes:

$$Q = \frac{\pi \times 2.25 \times 2{,}000 \times 2.7 \times 10^{-9}}{3 \times 48 \times 2.32 \times 10^{-7}} = 11.43 \text{ in.}^3 \text{ per min.}$$

Assuming that the volume of the barrel below the plunger is completely filled during the upstroke, this rate of leakage can occur only during the upstroke, or approximately one-half of the total time, and the net slippage past the plunger is .72 in.³ per minute, or 0.85 bbl. per day. The displacement of a 2¼-in. pump operating at fifteen 48-in. strokes per minute is 426 bbl. per day and the slippage in this case is only about 0.2 per cent, which is insignificant. The results with this and other plunger clearances with 3-centipoise oil are shown in Table 1.

In the case of 0.020-in. plunger clearance, the slippage loss when pumping water with a viscosity of 1 centipoise would be 755 bbl. per day, which is more than the pump displacement, and it would be impossible to pump water to surface, or to a level giving 2,000 psi. pressure differential across plunger. However, when pumping oil with a viscosity of 100 centipoises, the slippage would be only about 7.5 bbl. per day, or less than 1.5 per cent of the pump displacement, and a clearance of 0.020 in. is reasonably satisfactory for this condition.

It is pointed out that slippage losses result directly in power losses and it requires the same power to lift the plunger with 90 per cent of the fluid slipping past the plunger during the upstroke as is required with 1 per cent or less slip. The energy dissipated in slippage losses results in an increase in temperature of the oil within the pump, and a decrease in viscosity, which further increases slippage losses. Excessive slippage losses also increase the chances of forming emulsions, where water is produced with the oil.

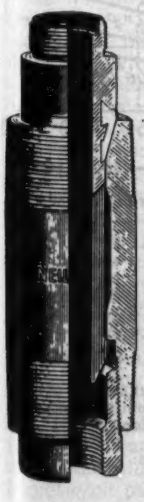
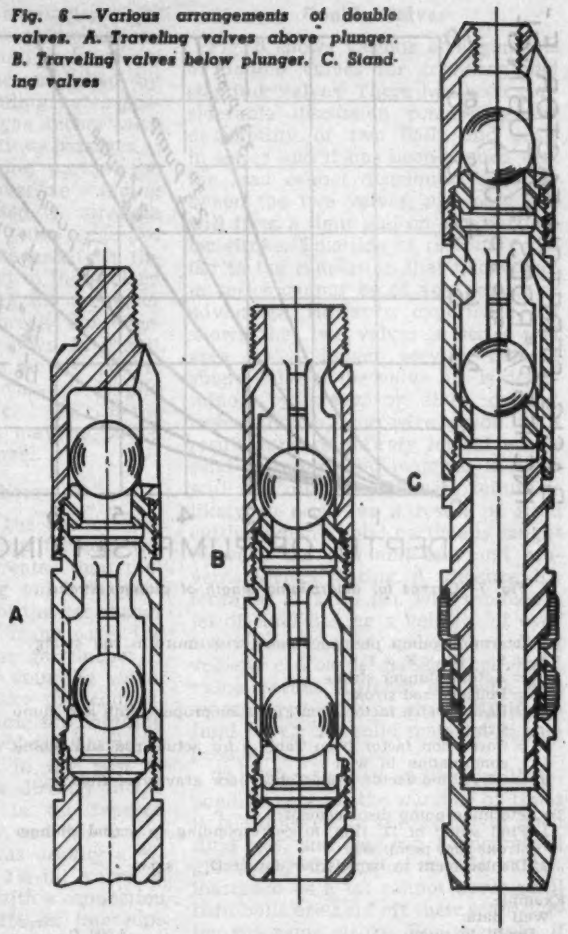


Fig. 4—(Left) Bottom lock holddown and shoe assembly. Fig. 5—(Right) Standing valve seating shoe with oversize gas-anchor connection

Fig. 6 — Various arrangements of double valves. A. Traveling valves above plunger. B. Traveling valves below plunger. C. Standing valves



Close plunger clearances are relatively more important with small-bore pumps than with larger bores, inasmuch as the displacement for a given stroke length, and speed, varies as the square of the diameter, while slippage varies as the first power of the diameter. Close plunger clearances are especially important in small pumps operated at extremely low speeds as used in stripper wells in some areas. It is believed that the method outlined above is satisfactory for evaluating maximum slippage to be expected in all cases.

Relatively clean oil, or water, can be pumped very satisfactorily with cups when the cups are properly selected for the load, well fluid, and temperature, and are properly installed. Carefully controlled tests have shown that cups will cut out rapidly at common pump pressures if

TABLE 1—LOSSES FROM SLIPPAGE PAST 2¼-IN. PUMP PLUNGER (48-IN. LONG) WITH 2,000 PSI. PRESSURE DIFFERENTIAL. 3-CENTIPOISE OIL. WITH VARIOUS PLUNGER FITS

Diametral clearance (in.)	Slippage rate in.³ per min.	Slippage loss in pump		
		In.³ per min.	Bbl. per day	Per cent of pump displacement*
0.003	11.43	5.72	0.85	0.2
0.006	91.5	45.8	6.8	1.6
0.010	424	212	31.5	7.4
0.020	3,390	1,695	251.8	59.2

*For fifteen—48-in. strokes per minute.

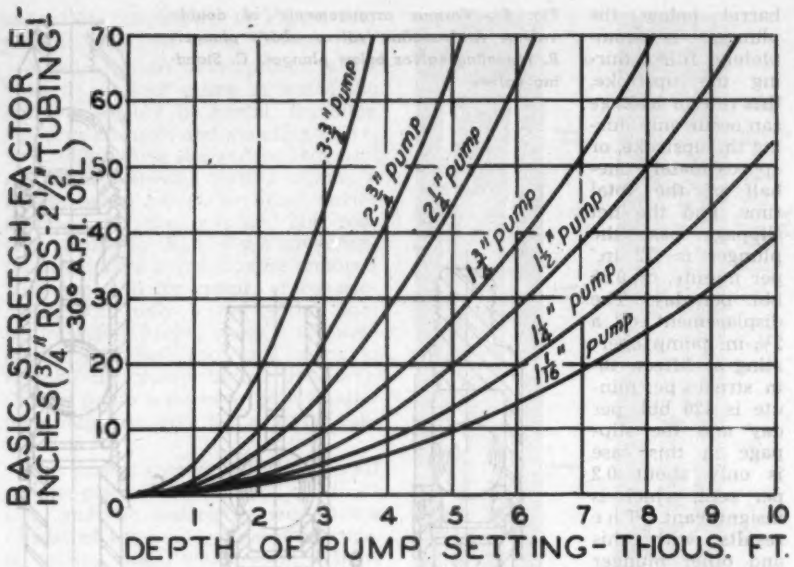


Fig. 7—Curves for determining length of plunger stroke

To determine pump plunger stroke with uniform rod string:

$S_p = S_1 - (E_1 \times F_1 \times F_2)$

S_p = Actual plunger stroke
S_1 = Polished-rod stroke
E_1 = Basic stretch factor from Fig. 7 for proper depth and pump size
F_1 = Correction factor from Table 3 for actual rod and tubing combination in well
F_2 = Correction factor from Table 4 for gravity of fluid

To determine pump displacement:
1. Find value of D_1 (Fig. 8) corresponding to actual plunger stroke and pump size
2. Displacement in barrels per day = $D_1 \times$ s.p.m.

Example:

Well data:	
Depth to pump	4,500 ft.
Pump size	1¾-in. i.d.
Rods	⅞-in.
Tubing	2½-in.
Length of P.R. stroke	48-in. = S_1
S.p.m.	20
A.P.I. gravity	25

From Fig. 7—E_1 for 1¾-in. pump at 4,500 ft. = 21.6 in.
From Table 3—F_1 for ⅞ rods, 2½-in. tubing = 0.787
From Table 4—F_2 for 25 A.P.I. = 1.03
Plunger stroke—S_p = 48 — (21.6 × 0.787 × 1.03) = 30.5 in.
From Fig. 8—D_1 = 10.8 for 30.5-in. stroke, 1¾-in. pump
Displacement = 10.8 × 20 = 216 bbl. per day

To determine plunger stroke with tapered sucker-rod string:
Let A = Length of ⅝-in. rods in string
B = Length of ¾-in. rods in string
C = Length of ⅞-in. rods in string
D = Length of 1-in. rods in string
Y = Total length of rod string
(3) Plunger stroke $S_p = S_1 - E_1 F_2$

$$[(F_{1A} \times \frac{A}{Y}) + (F_{1B} \times \frac{B}{Y}) + (F_{1C} \times \frac{C}{Y}) + (F_{1D} \times \frac{D}{Y})]$$

Where
S_1 = Polished-rod stroke
E_1 = Basic stretch factor from Fig. 7 for depth and pump size
F_{1A} = Correction factor from Table 3 for ⅝-in. rods in tubing used
F_{1B} = Correction factor from Table 3 for ¾-in. rods in tubing used
F_{1C} = Correction factor from Table 3 for ⅞-in. rods in tubing used
F_{1D} = Correction factor from Table 3 for 1-in. rods in tubing used
F_2 = Correction factor from Table 4 for gravity of fluid

Note that any particular term in parenthesis is used only if there is a rod size in the string corresponding to the letter (A, B, C, or D) appearing in this term. For example, if a tapered string consists only of ⅝-in. and ¾-in. rods Equation 3 becomes:

$$S_p = S_1 - E_1 F_2 [(F_{1A} \times \frac{A}{\ }) + (F_{1B} \times \frac{B}{\ })]$$

TABLE 3—CORRECTION FOR ROD AND TUBING COMBINATIONS

Rods (in.)	Tubing (in.)	Factor F_1
⅝	2	1.44
	2½	1.36
	3	1.30
¾	2	1.08
	2½	1.00
	3	.941
⅞	2½	.787
	3	.729
	4	.690
1	2½	.648
	3	.590
	4	.551

TABLE 4—CORRECTION FOR GRAVITY OF FLUID

Sp. Gr.	A.P.I. Gr.	Factor F_2
1.25		1.43
1.20		1.37
1.15		1.31
1.10		1.26
1.00	10	1.14
.966	15	1.10
.933	20	1.07
.902	25	1.03
.875	30	1.00
.850	35	.972
.825	40	.943
.802	45	.916
.780	50	.892

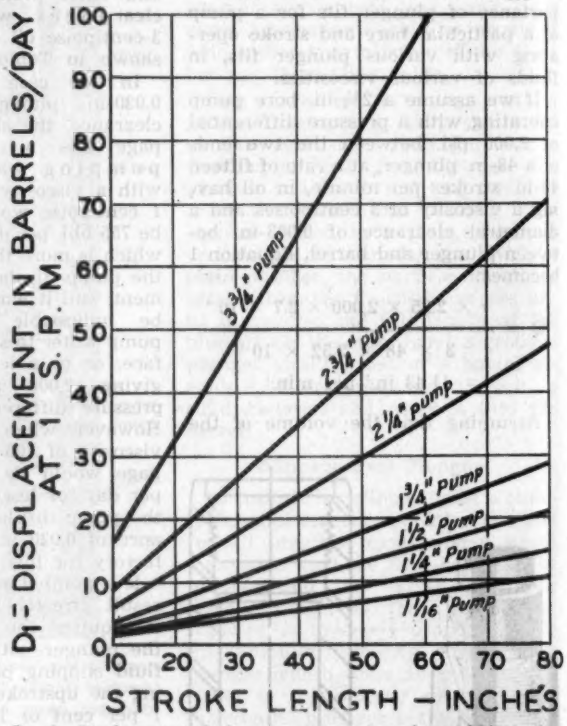


Fig. 8—Displacement of plunger pumps in barrels per 24-hour day = $D_1 \times$ strokes per minute

Example:

Depth to pump	4,500 ft.
Pump size	1¾-in.
Rods 2,400 ft.	¾-in. = B
2,100 ft.	⅞-in. = C
Tubing	2½-in.
Length of P.R. stroke	48-in. = S_1
A.P.I. gravity	25

From Fig. 7—E_1 for 1¾-in. pump at 4,500 ft. = 21.6 in.
From Table 3—F_{1B} for ¾-in. rods and 2½-in. tubing = 1.00
F_{1C} for ⅞-in. rods and 2½-in. tubing = 0.787
From Table 4—F_2 for 20° A.P.I. oil = 1.03
Using ¾-in. and ⅞-in. rods, Equation 3 becomes:

$$S_p = S_1 - E_1 F_2 [(F_{1B} \times \frac{B}{Y}) + (F_{1C} \times \frac{C}{Y})]$$

$$= 48 - (21.6 \times 1.03) [(1 \times \frac{2,400}{4,500}) + (0.787 \times \frac{2,100}{4,500})]$$

$$= 48 - 22.25\ (0.535 + 0.367)$$

$$= 48 - (22.25 \times 0.90) = 28\text{-in. plunger stroke}$$

they fail to expand properly and prevent slippage, but they will conform to the barrel and form a tight seal if they can be operated a few hours without appreciable slippage. For this reason a traveling valve consisting of cups and composition rings, as shown in Fig. 1 "C," has given very satisfactory service. The composition rings form a satisfactory seal during the "breaking in" period and prevent damage to the cups resulting from slippage. When cups are allowed to wear in in this manner they will operate with no measurable slippage, and automatically take up wear until they are completely worn out. After the cups are worn in, there is no load on the rings and very little wear. The rings serve an additional purpose throughout the life of the cups in that they act as a guide to maintain the cups in proper alignment and as a wiper to remove any abrasive material from the barrel on the downstroke. Similar conditions result with the so-called repack, or coil packing used in combination with cups.

Effect of Gases and Vapors

In selecting pumping equipment for oil wells it should be remembered that in a majority of cases some of the constituents of the fluid being pumped are above, or near, their boiling points at pressure and temperature conditions existing within the pump, and large volumes of dissolved gases and vapors may be set free with a slight drop in pressure of the well fluid, in addition to the free gas in the fluid. For this reason it is very difficult to pump some wells down, and many wells will apparently pump off with several hundred feet of fluid standing in the hole because the condensable vapors, and gases, occupy the entire displacement volume of the pump, and the pressure below the plunger cannot be raised to that of the tubing pressure—which is necessary before the traveling valve can open and deliver oil to the tubing—without a relatively high intake pressure, which decreases the compression ratio. On the downstroke the vapors may condense and occupy a very small volume without an appreciable increase in pressure, and only the permanent gases are effective in increasing the pressure in accordance with the gas laws.

There are two precautions to take to minimize the adverse effect of vapors and gases:

1. The compression ratio should be made as high as possible. This is accomplished by using a closed-cage type valve below the plunger with a stationary barrel pump, or a valve above the plunger with a traveling-barrel-type pump; spacing the pump so the traveling valve and standing valve come as near to each other as possible at the lowest position of the rods, without making contact; and using as long a stroke as possible with the equipment available.

2. Flow velocities and turbulence at the pump inlet should be kept at a minimum. This is accomplished by using the largest standing valve possible, and a suitable gas anchor with the largest possible flow passages.

In the case of tubing pumps, the choice of regular or oversize standing valves may be dictated by strength requirements of the valve cage for use in deep wells inasmuch as the cage may be subjected to the sucker-rod load when spacing the pump, or in the case of a rod break. The oversize standing valve shown in Fig. 1 "B" has a flow area nearly double that of the standard valve body and seat illustrated in Fig. 1 "A," in the 1¾-in. size, and still may be pulled through the pump barrel.

Gas Anchors

In general, where gas anchors are used, the pressure drop through the gas anchor pipe is greater than that through the standing valve because of the greater length of the gas anchor flow passage, and in many cases the inside diameter of the gas anchor is less than that of the standing valve. It is important to make this connection as large as possible for handling extremely gassy or volatile fluids. It has been customary in the past to attach the gas anchor directly to the threaded connection in the tapered cup nut or valve body, and this thread for a 1¾-in. valve was usually a ¾-in. pipe thread. A 2¼-in. valve is commonly equipped with a connection for 1-in. pipe, and 1½-in. line pipe is often used with a 2¾-in. standing valve. Fig. 5 shows a design for a standing valve seating shoe which permits the use of larger gas anchor connections in standard line pipe sizes, and Table 2 shows the effect on flow velocities and pressure drops for a particular case when using a 10-ft. gas anchor and substituting 1¼, 1½, and 2-in. line pipe sizes and the ¾, 1, and 1½-in. sizes previously used.

It is noted that in the cases of the 1¾ and 2¼-in. bore pumps there is a reduction in pressure drop of 89 and 86 per cent, respectively, and the flow remains in the viscous region when using oversize gas anchors. Both of these factors can have a very great effect in preventing the liberation of dissolved gas, and condensable vapors, and should result in much more efficient pump operation and in a higher effective productivity of a well producing highly volatile or gassy oil.

Double Valves

Fig. 6 shows various arrangements of double valves for traveling and standing valves. There has been considerable discussion concerning the desirability of two balls and seats in series and it has been argued that the load cannot distribute itself between the two valves, and only one will form a tight seal on any particular stroke. This line of reasoning has led to the conclusion that two valves in series cannot be of any particular advantage. However, experience has shown that two valves in series will give much longer service than a single valve if the valve life is determined by wear, or fluid cutting, rather than by corrosive action. This result appears entirely logical where sand or other solid material is lifted with the oil. In such cases failure is likely to occur as a result of fluid cutting when a solid particle is caught between the ball and seat and prevents perfect seating. A pressure differential of 2,000 psi. will produce a jet of fluid having a velocity of over 500 ft. per second and such a fluid velocity can easily damage the lapped valve-seating surfaces on balls and seats in a short time especially if the fluid jet carries solid material in suspension.

The life of a ball and seat will depend largely on the number of times it is subjected to the action of such fluid jets, and this can be decreased greatly by the use of double valves, inasmuch as a jet cannot occur until both balls are held off their seats during the same stroke. For example, if conditions are such that a single ball and seat is prevented from seating properly one out of each 100 strokes, on the average, the chances of both of two valves in series failing to seat properly will be reduced to 1 in 10,000 strokes. Furthermore, when this occurs the pressure drop will be distributed between the two leaking valves and the cutting action will be less severe than with a single valve.

The extra first cost of double valves is so small in comparison with the average pump pulling job that the use of double valves should be well justified by the savings resulting from fewer pulling jobs. Also, fewer balls and seats should be required over a long period of operation because of the much greater life to be expected under average conditions.

The only apparent objection to double valves is the possibility of af-

(Continued on page 141)

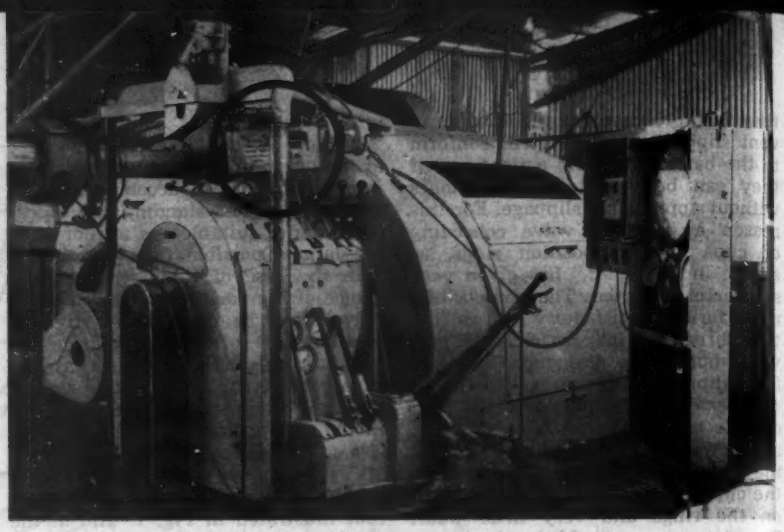
TABLE 2—VELOCITY AND PRESSURE DROP THROUGH REGULAR AND OVERSIZE GAS ANCHORS 10 FT. LONG—54-IN. STROKE—20 S.P.M. 100-CENTIPOISE OIL

Regular anchor					Oversize anchor				
Pump bore (in.)	Pipe size (in.)	Max. Vel. F.P.S.	Type flow	Pressure drop (psi.)	Pipe size (in.)	Max. Vel. F.P.S.	Type flow	Pressure drop (psi.)	Dec. in pressure drop (%)
1¾	¾	21.3	Turbulent	21.2	1¼	6.43	Viscous	2.3	89
2¼	1	21.6	Turbulent	16.7	1½	9.19	Viscous	2.4	86
2¾	1½	13.7	Turbulent	4.5	2	8.35	Turbulent	1.3	71

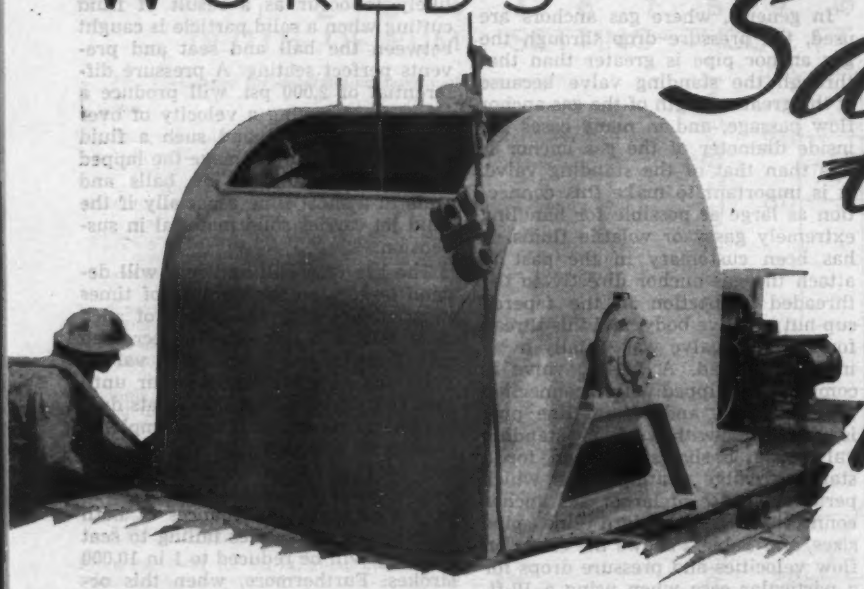
(Right) Master speaker-receiver unit on left side of this draw works provides the driller with instant two-way communication with all drilling-crew members

(Below) Power hoists can do many jobs on and around rig floors—pulling, lowering, moving—with both safety and good control

(Bottom of page) Power slips such as these reduce crew fatigue on trips in and out of the hole, add to safety



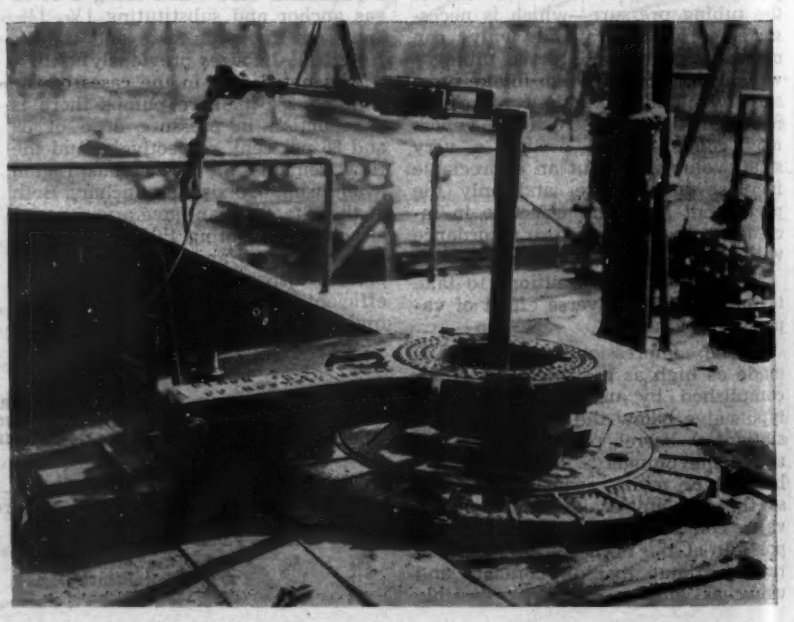
WORLD'S *Safest* (OR IDEAL) *Rig*



by Guy H. Creighton*

THE above title may, in some instances, be the object of humorous comments or jibes, depending upon the attitude of readers. Some drilling contractors, foremen, drillers, or others may point out that the "ideal" rig is one that is stripped of everything but the bare essentials needed for making the most hole in the least time. Others may contend that real efficiency in drilling oil wells is attained by making good progress and at the same time preventing accidents.

The writer is inclined, naturally, toward the latter point of view. Accidents on drilling rigs can be very costly. Shutdown time because of accidents means money lost through machinery and rig damages, possible loss of experienced men through injuries, and lost profits because drilling rigs earn nothing unless "hole" is being made. Regardless of whether damage to machinery occurs, progress

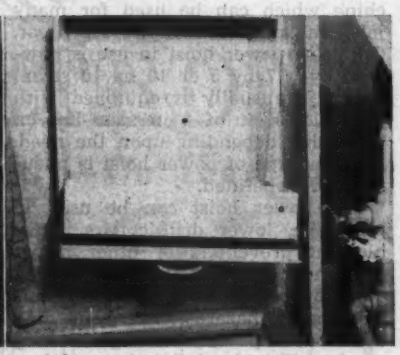


*Safety engineer, Midland, Texas.

(Left) Steel rack for hanging slips, pulleys, and various equipment out of way, eliminates stumbling hazard

(Below, left) This reel keeps the water hose neatly rolled up—eliminates stumbling and tripping hazards

(Below, right) This first-aid kit is normally closed to keep out dirt, but quickly opens outwardly into tray form



will be retarded when experienced personnel are unable to perform regular duties because of injuries.

Many new developments in machinery and equipment for drilling rigs may be considered safety devices because of increased efficiency with less manual effort. Other devices have been developed or are in various stages of development from a purely safety standpoint.

Power or Pneumatic Slips

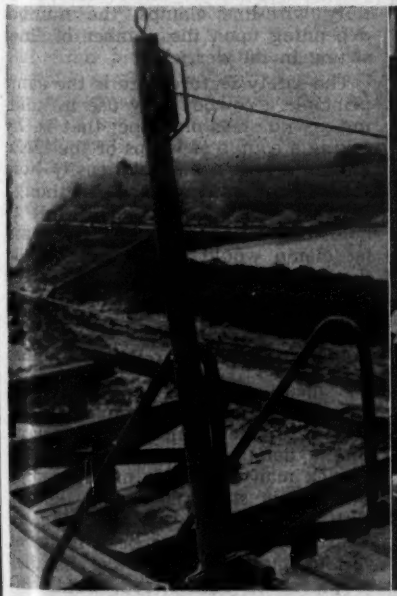
Power slips represent a big stride toward safety for drilling rigs. They would be considered a must item for the ideal or safest drilling rig.

One manufacturer's power slips are built for heavy duty and have been tried and proved in the field. They very capably handle the heaviest loads found in the drilling of deep wells. They handle a wide range of pipe sizes, from 2⅜ to 7 in., including tubing, drill pipe, and casing. Further, they can and have been used on cementing jobs, handling up to 8½-in. casing. This is possible because they can be pressure set as well as pressure raised. The driller operates the slips by a foot-actuated control valve. Power supply can be air, steam, or hydraulic. Most efficient operation is attained through pneumatic power. Any compressor may be used provided it is of at least 16-cu.-ft. capacity at 120 psi.

A safety stop is incorporated in the construction of the mechanism which in case of failure of power supply holds slips in the raised position until power is restored. Then they will release automatically.

Drillers and drilling foremen differ

(Left) Closeup of automatic tong retractor mounted on edge of derrick structure. The spring-actuating mechanism inside the pipe eliminates striking and tripping hazards. (Center) Neatly arranged hand-tool rack located next to driller. (Right) Everybody is proud of good safety records and rig bulletin boards such as this one tell the safety time "score" so that all can know



in their opinions as to speed on trips while using the power slips. Some contend they are faster and others believe they are a little slower.

The greatest safety factor of power slips probably is the fact they are a labor-saving device, Too many injuries on drilling rigs occur to men who are fatigued. Also, many head injuries occur when men are struck by elevators as they are lowered to the rotary during a trip with drill pipe. This type injury may result because of a lack of complete coordination among all men at the rotary or between them and the driller.

Power Hoist Instead of Cathead for Lifting

The power hoist is an efficient machine which can be used for many jobs on and around the rig floor. One type power hoist in use is powered by a 7 by 5 or 10 by 10 steam engine. It usually is equipped with 10,000-12,000 ft. of ⅞-in. sand line on the drum, depending upon the need. Another type of power hoist is pneumatically operated.

The power hoist can be used to pull pipe, lower drill collars, move blowout preventers or other heavy equipment, rigging up, and many other purposes. Its use should eliminate many hazards. The sand line used on a power hoist gives long service. This is definitely a safety factor.

Automatic Tong Retractor

The automatic tong retractor is a very simple device and when installed on a drilling rig may be especially valuable in eliminating mashed hands and fingers and injuries to the body caused by bumping against or being struck by swinging tongs.

The only manufactured tong retractor of which the writer has knowledge is one made by Edwards Tong Retractor Co. of Bay City, Tex. This retractor is made up of 3-in. pipe with a heavy steel plate welded on one end to serve as a base. It is fastened in a vertical position to the derrick structure. Inside the pipe is fastened a strong coil spring to which is attached a ⅝-in. cable. The cable works between two pulleys set close together, one above the other, vertically in a slot at the upper end of the 3-in. pipe and on the side directly facing the rotary. The cable is then fastened to the tongs and serves, by means of the spring, to pull the tongs back out of the way each time a connection is made.

The principal safety feature of the automatic tong retractor is having the spring inside the pipe instead of flopping around on the floor. It eliminates stumbling and tripping hazards as well as the possibility of a man being struck by the spring and cable when it becomes taut with application of power.

Many painful hand injuries have resulted when swinging tongs have struck men engaged in pushing a joint of pipe out of the V-door while laying down pipe. The tong retractor obviously would prevent this type of injury.

Automatic Tubing Tongs

The power tongs manufactured by one company are pneumatically operated and are used for making up and breaking out 2-3½-in. tubing. They are suspended in the derrick by a wire line, as is done with rotary tongs. Swinging the tongs against the tubing locks the jaws automatically. The jaws and the tubing are rotated by applying power of a pneumatic motor through a two-speed gear to a split-ring gear to which the jaws are attached. To change from the breakout to makeup position the tongs are simply turned over by means of a roll-over ring.

These tongs have controlled and uniform makeup through controlled torque. Tubing is made up until motor stalls. To release the tongs the motor is reversed, which allows the tongs to swing free. Breaking out in low gear the tongs deliver a torque of 3,620 ft.-lb. After one turn of tubing, the tong may be placed in high gear for more rapid breakout. The stalled torque in high gear is approximately 843 ft.-lb.

Any source of air that can supply 25 cu. ft. per minute at a minimum pressure of 100 psi. should be sufficient. Approximately 17 cu. ft. of air per joint is needed.

These tongs are 54¾ in. long, 29 in. wide, and 20 in. in height. They weigh approximately 400 lb.

The fact that the running time per joint is approximately 20 seconds is a good argument for their use, both from the standpoint of efficiency and safety. The labor-saving factor alone makes the tong a safety device. Slipping and falling hazards are minimized also since the need for heavy pulls on conventional tubing tongs while standing in slippery, oily surfaces is almost entirely eliminated.

Water-Hose Reel

The water-hose reel is simply a small reel of perhaps 20-in. diameter such as may be used for electric wire or cord. It is mounted on small A-frame type brackets and is secured to the rig floor. The water line runs through the hub of the reel and connects to the hose.

Chief safety factor of the water-hose reel is the fact the hose can be neatly rolled up out of the way. This eliminates stumbling and tripping hazards. It also is a contributing factor in good housekeeping and this is important in preventing accidents.

Intercommunication System

A two-way communication system set up on a drilling rig enables crew members to converse with the driller from various points of the rig. It consists of a power unit with a number of selector switches. Speakers are installed at vantage points. By pressing a switch button the driller may speak to the derrick man. On releasing the button the driller is able to hear the derrick man's reply. In a like manner the driller may speak to men in the dog house, the mud house, or wherever speakers may be located.

This system may be very valuable in preventing accidents. It usually is difficult enough for the driller to hear a derrick man or vice versa by shouting. This is especially true in areas like West Texas, where high winds prevail much of the time.

One instance to the knowledge of this writer when a possible serious injury or even death was prevented can be attributed to the speaker system. While going in the hole, a driller picked up on drill collar. The derrick man called down: "Watch that nubbin." The driller immediately stopped the power and applied the brake, easily, to prevent the traveling blocks from swinging. The lift plug had broken off, allowing the plug to come loose. The lift plug was sitting on the elevators. Had the blocks been swaying or moving rapidly the "nubbin" may possibly have fallen to the floor.

Dead-Line Anchor

One type of manufactured dead-line anchor is a steel, wheel-like drum of approximately 8-in. width and 20-in. diameter built onto a heavy steel leg with a base which is fastened by heavy U-bolts to the substructure. The drum is set in a vertical position on the leg. The drill line is carried around the drum at least two wraps, then through a heavy rectangular clamp which is part of the leg, and held by eight 1-in. bolts. Then the line makes two wraps above and below the substructure and the loose end fastened with several heavy-duty wire-line clamps, the number depending upon the number of lines strung in the derrick.

The safety feature here is the same principle a cowboy may use in holding a wild steer or bronc; that is, by taking a couple of wraps of the lariat around a post a man can easily hold the wild bronc or cow. Even though the wire-line clamps should fail to hold, or become loose, the rectangular clamp would still serve to hold the line and the wraps around the drum offer further resistance to slippage.

Measuring Stick for Derrick Man

A measuring stick for the derrick man is a piece of aluminum tubing of ¼-in. diameter and about 5 ft. long with a handle attached. With it the derrick man can easily measure pipe while it is standing in the derrick with little danger of dropping it. Measuring sticks have been made of various materials from axe handles to pieces of sucker rod. Some in-

juries have resulted in that way. In addition to being so easily handled so as to prevent dropping, the aluminum measuring stick is so light that it would not be likely to cause injury should it be dropped on a man below.

First-Aid Kits—Foille Kits

First-aid kits certainly are not new but their use and application on drilling rigs may be new from some angles. The judicious use and care of such kits on drilling rigs, in some cases at least, may be comparatively recent. Not so many years ago many drilling rigs operating throughout the country carried no first-aid kits. Further, not so many years ago, many drilling crews would not have bothered to make use of such kits. Only in recent years have many companies recognized the value of first-aid training and induced men to use the available first-aid supplies for minor injuries. Usually one man accepts the responsibility of keeping the kits full. Best safety features of kits available today are:

1. Plentiful supply.
2. Easily accessible.
3. Attractively packaged.

Foille kits for treatment of burns are almost a must. Sometimes drilling rigs are located in remote areas. The fact that burns are probably the most painful and among the most dangerous of all types of injuries makes the installation of Foille kits on drilling rigs highly desirable. Foille rapidly is being recognized as the best available treatment for burns. It is available as a liquid or salve. The liquid comes in glass jars. A spray gun which can be screwed onto the jar acts in much the same manner as an atomizer. The liquid Foille is sprayed on the burned surface. The product is said to have the properties of affording almost immediate relief from the extreme pain caused by burns. Since severe shock always accompanies a bad burn, prompt relief from pain and suffering is important in the recovery of patients. Foille is reputed also to contain properties of healing so quickly and thoroughly as to minimize the possibility of scars. Since Foille is not an oil-base preparation, it need not be removed by physicians for the purpose of examination or dressing of burned areas.

For burns about the eyes Foille should be brushed on the affected areas. A small, soft brush is furnished with all complete Foille kits for such purposes.

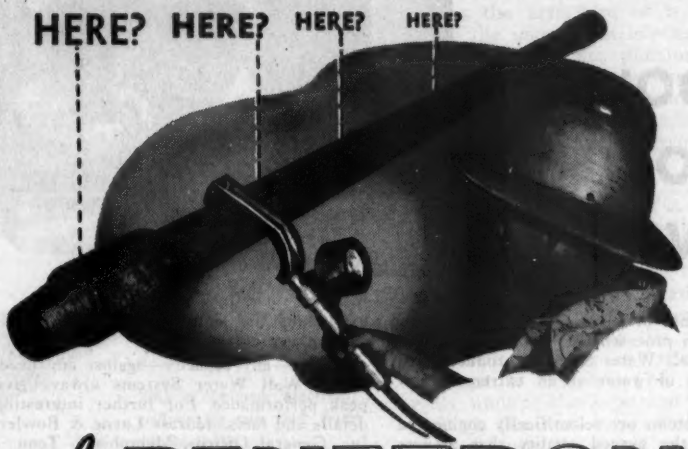
Foille salve comes in tubes and may be squeezed onto burned areas. The salve is intended for treatment of small-area burns when the use of the spray gun would not be considered necessary.

Bulletin Boards and Posters

Once considered of no value, and needless equipment on drilling rigs,

How Thick Is The Wall

HERE? HERE? HERE? HERE?



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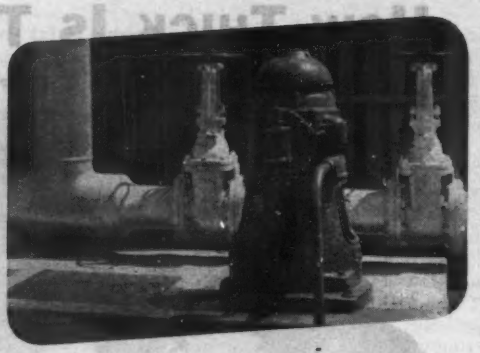

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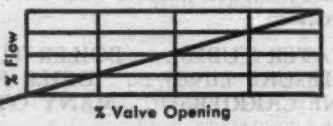

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the bulletin board now is a generally accepted fixture on most rigs. Not only does it serve as space for the posting of company notices and statements of policy, etc., but is excellent for the prominent display of safety bulletins, news, posters, etc. If placed in a conspicuous place in the dog house or other such place they will be noticed and read.

One of the best poster services available for drilling rigs is that offered by the American Association of Oilwell Drilling Contractors. Their posters depict accidents on rigs based on actual occurrences and are very good for the purpose.

Fire Extinguishers

Fire extinguishers are not new, but their installation on drilling rigs is comparatively recent. The principal reason for this is the fact that until just a few years ago practically all rigs were steam operated. Steam and water under high pressure were generally sufficient to extinguish most fires.

The power rig has almost entirely supplanted the steam rig in West Texas because of a lack of plentiful water supply. This changeover has not occurred on as large a scale in other areas, such as East Texas and Louisiana. Sources of water supply are much more plentiful in those areas. At any rate, most operators of power rigs have as regular equipment several fire extinguishers, usually of the dry-powder or carbon dioxide type. These types of extinguishers are best for electric rigs also.

Tool Boards and Racks

Most operators of drilling rigs have recognized the value of proper maintenance and storage of hand tools. Small tools, improperly maintained and used, cause many personal injuries. By installing tool boards and racks on drilling-rig floors, the crew can keep them in better condition and be able to find the proper tool for a job. Using a tool on a job for which it is not intended leads to many injuries. Tool boards and racks lend themselves to better housekeeping, a big factor in the prevention of accidents. A good rule for hand tools is "the right tool for the job, use the tool in the right way, keep it in good repair, put it in its proper place when not in use."

Conclusion

There doubtless are other safety devices for drilling rigs not mentioned here. There will surely be newer and better devices developed for safer operation of drilling rigs.

But regardless of the number of safety devices installed on a drilling rig—however intricate or costly, whatever claims are made for them—there will continue to be accidents and injuries until the crews operating those rigs make a determined effort to stop them. Each man's safety is, in a large measure, up to him.

This is the new electrical caliper for use with horizontal tubes

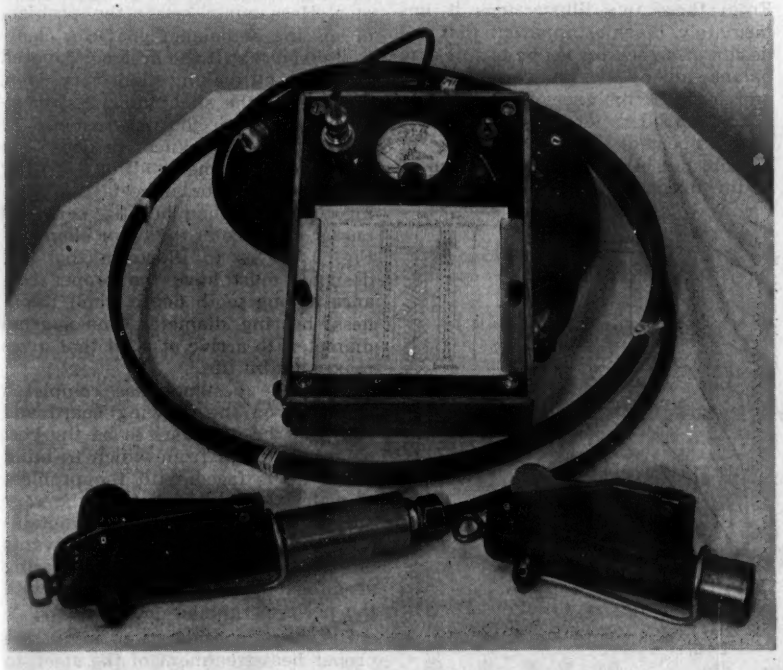
Electrical Calipers for Inspecting Vertical and Horizontal Tubes

by I. S. Roberts*

SHOWN here are two models of electrical calipers for measuring tube diameters in refinery and plant inspection work. The newest one is for use with horizontal tubes; the vertical caliper model has been in successful operation at a number of refineries for upward of 5 years.

*Address: 412 Harrison Street, Ridley Park, Pa.

Unlike the vertical caliper, the horizontal caliper has only one pivoted contact finger and rides on two tungsten carbide balls which serve as the other two contact points of a three-point system. The pivoted finger is forced by spring pressure into continuous contact with the upper inside surface of the tube and, in turn, positions the armature of a solenoid. When the instrument is connected to an a.c. circuit, the position of the armature fixes the reactance of the solenoid coil and this is indicated by the meter. The meter is calibrated to show the corresponding inside diameter of the tube.



The vertical type calipers have been in successful use for over 5 years

In operation, a helper pushes the spring-steel tape through a tube, the inspector clips it to the swiveled eye fitting of the measuring head and pushes the head into the tube. The helper then pulls the head through the tube while the inspector watches the meter and notes the maximum inside diameter or any other measurement of interest. The helper finally unclips the tape and pushes it through the next tube while the inspector pulls the head back by the electric cable and checks any marginal measurements. The cord may be calibrated to indicate the longitudinal position of measurements.

The horizontal caliper has the same general advantages as the vertical caliper. It is fast, convenient, and accurate. It provides a continuous indication of inside diameters rather than a series of spot measurements and is therefore unlikely to miss any critical points. The measuring head contains no intricate or delicate mechanisms which might be adversely affected by rough treatment, heat, or abrasive dust. There is no switch, slide-wire resistance, or other device inside of the measuring head to cause hazardous electric sparks.

Since the caliper is essentially a three-point gage, it is intended for use with tubes having smooth inside surfaces and substantially circular sections and is not recommended for use with badly pitted tubes. It is especially effective in spotting and measuring the annular rings which are sometimes caused by cleaner tools. Because of its accuracy, it is useful in plotting the rates of wear of tubes at key locations or of materials under test. Engineers at a midwestern refinery who have used the horizontal caliper for several months report that their experience with the caliper has been very favorable and that it reduced the time required to measure tubes from 50 to 75 per cent.

Both calipers were developed by the author, formerly an engineer at a large eastern refinery. The calipers are made in either vertical or horizontal style for tubes having minimum inside diameters between 2½ and 4½ in. and for measuring ranges above these minimums of 0.30 to 1.00 in. Their accuracy is about 1 per cent of full-scale reading, i.e., plus or minus 0.01 in. if the range is 1.00 in. Up to four interchangeable contact point units of different range or style are designed for use with a single meter box, cable, and coil unit.

Rock-Bit DESIGN

— — — — and experimental data

by Wiley B. Noble

THE fundamental and most confining of all considerations in the design of any rock bit is simply one of space or room. It must be kept in mind that in the design of a rock bit, every part of the bit that digs the hole must be contained inside the diameter of the hole. This merely means that every element of a rock bit that digs an 8¾°in. hole must be inside of an 8¾-in. diameter circle. In rock-bit design, if a large-diameter cutter is indicated, this change can be accomplished only by compromise with other parts in the bit. Space consideration can more clearly be seen by examining Fig. 1, which illustrates the clearance between cutters of a bit. It is evident that if the outside cutter is made wider by moving its inside face over to the dotted line "A-A," the radius of the second cutter must be made smaller a corresponding amount, this being shown by the dotted circle of diameter "D_1." This condition would favor the outside cutter considerably, as a greater roller-bearing capacity could be placed under it, and the second cutter would be weakened to the danger point. It might occur to the reader that the outside cutter could be made larger in diameter, as illustrated in Fig. 2. This could be done; but here again trouble would result. The outside cutter would contact with the wall of the hole in two spots causing early and premature wear. Further, the excessive diameter would cause cramping of the outside cutter bearings and quick failure would result. From these two illustrations it immediately becomes apparent that the design of a rock bit is one of intricate balance among the diameters, lengths, and angles of the axes of the cutters.

The consideration of space is not only important in the geometry of the bit, but is important with respect to the inside construction of the bit; that is, the parts one never sees, such as shell thickness, bearing diameter, and journal diameter. This is set forth in Fig. 3, in which several examples are illustrated showing an enlarged view of the sections taken through various cutters. In the design of a cutter of a specific diameter, the designer is faced with four considerations: tooth depth, shell thickness, bearing diameter, and journal diameter. Here again arises the problem of spacing or balancing. It can clearly be seen that if the designer favored the teeth by making them very deep, he reduces the shell thickness, bearing diameter, or journal diameter. If he favors shell thickness, he does so at the expense of one or all of the other three elements; or, if he favors bearing diameter, then he still penalizes one or all three of the other elements. Fig. 3 serves to illustrate that the designer must have the proper balance among tooth depth, shell thickness, bearing diameter, and journal diameter, to arrive at a bit that gives maximum bit life.

Once the designer has completed his work on the drawing board and has what he considers to be the best balanced design from which to build a bit, he is faced with the problem of materials. He knows from the very outset that the best materials obtainable will not be as good as he wants or needs, due to the ever-increasing need for longer bit life, combined with the need for greater penetration.

His next consideration is in the proper heat treatment of the steel, to obtain the hardenability, case, and

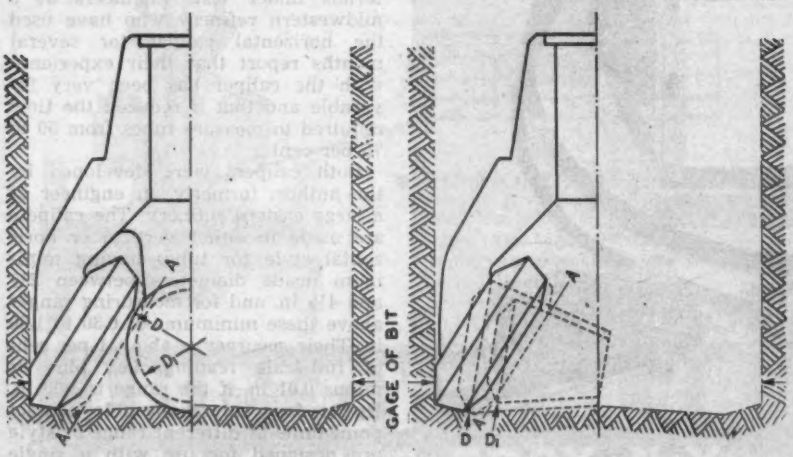
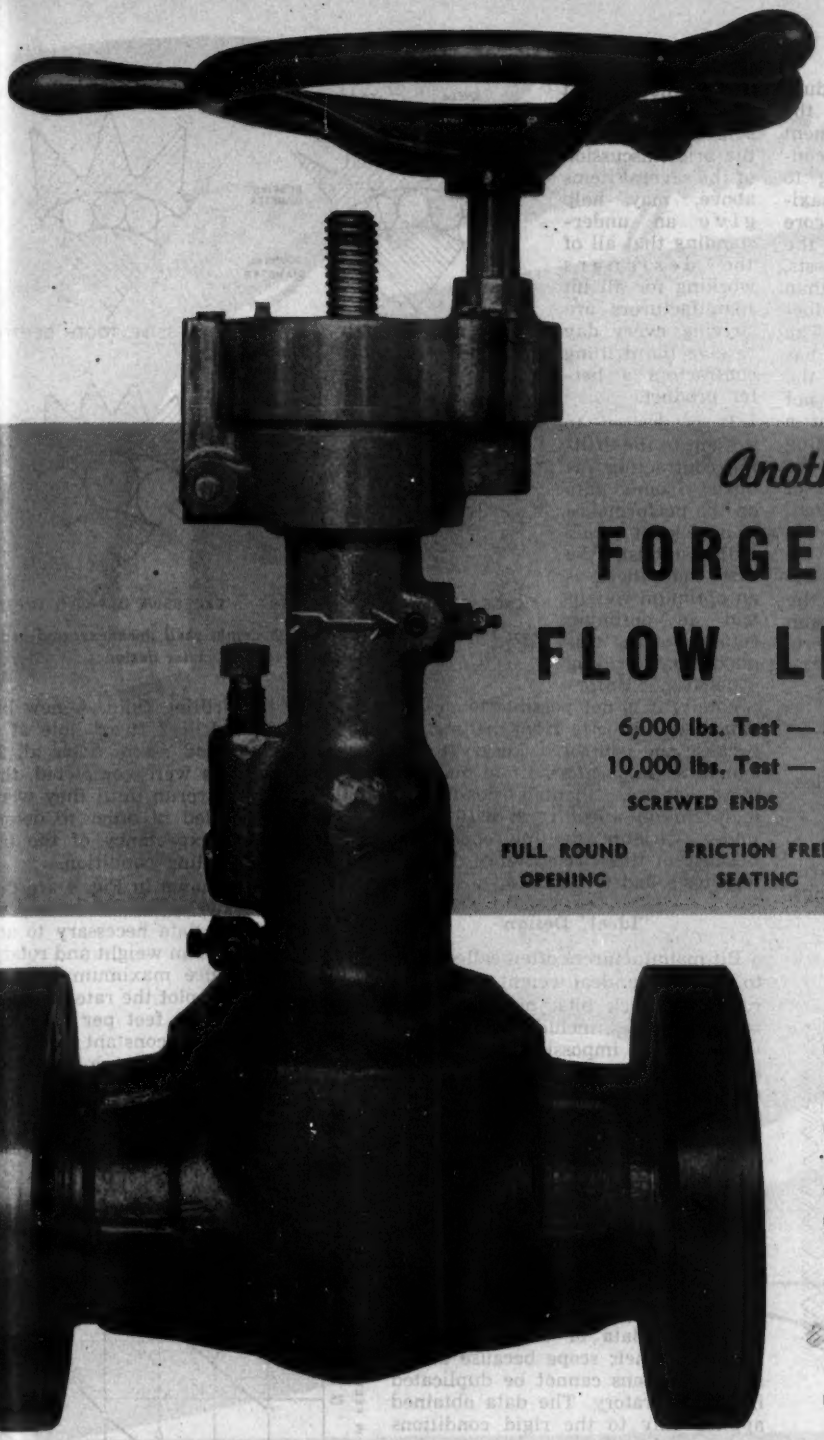


Fig. 1—Clearance between cutters of a rock bit

THE AUTHOR

The author is vice president and chief engineer for Reed Roller Bit Co., Houston. His paper given here is from the program of the American Association of Oilwell Drilling Contractors' convention held October 13-15 at Long Beach Calif. His paper is divided into two parts, the first dealing with the design of rock bits from dimensional and materials standpoint, and the second part emphasizing functional results obtained in rock-bit usage. Noble was born in Houston and received his education there. He graduated from Rice Institute with the B.S. and M.E. degrees in 1935. His start with Reed was in the patent department, with subsequent progression through the engineering department from draftsman, field engineer, development engineer, assistant chief engineer, war-products engineer, to his present position.



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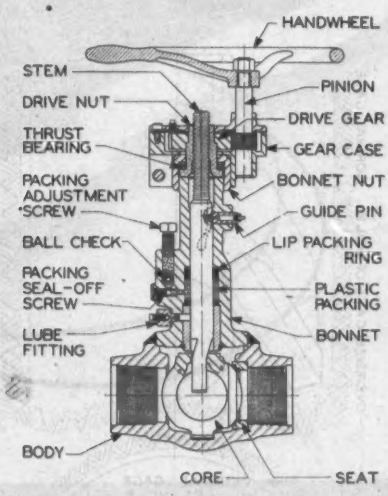

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core physicals necessary to produce long bit life. By case is meant the hardened surfaces of the component parts that have had their carbon concentration raised by carburizing to the point where they will give maximum resistance to wear. The core found in the component parts is the foundation on which the case rests, and must be considerably softer than the case in order to retain the ductility necessary for long bit life. The designer must know that the steel has been considered and approved by the metallurgical department, as it is not pleasant to face a bit failure at a later date—not because his designing was poorly done, but because the basic inherent physical properties of the steel were not what he expected.

Fundamental Considerations

Only two considerations which affect the design of the bit and the materials to be used in it have been discussed, but there are many more. The designer constantly must be aware of the following conditions:

1. Space requirements.
2. Materials.
3. Tooth design.
4. Hard metal-selection and application.
5. Bearings.
6. Tolerances.
7. Surface finish of working parts.
8. Frame of bit forgings, castings, weldments, etc.
9. Nozzle assembly.

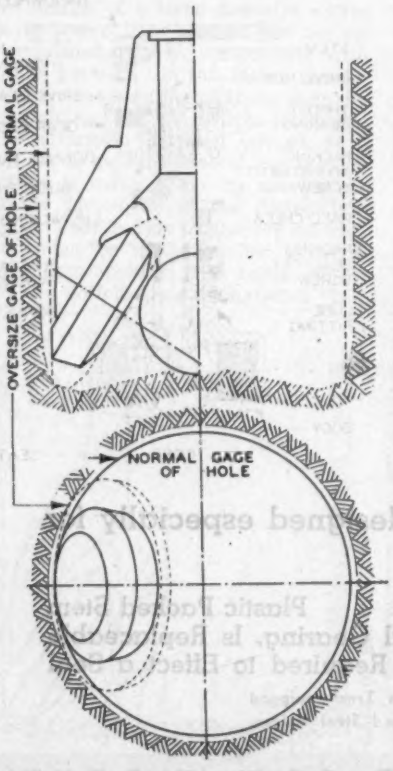


Fig. 2—Effect of oversize cutter diameter on size of hole

It is hoped that this list of design considerations, and the brief discussion of the several items above, may help give an understanding that all of the designers working for all bit manufacturers are striving every day to give the drilling contractors a better product.

It is desired to present to the drilling contracting industry some data on the performance of a rock bit which will establish the fact that there is an optimum weight and an optimum rotary r.p.m. for maximum drilling efficiency. Unfortunately, it is not possible to present data taken directly from drilling rigs because the control necessary to accumulate this information must be more accurate than is possible to maintain on a contract drilling rig under variable drilling conditions. Because of this circumstance, laboratory tests had to be used.

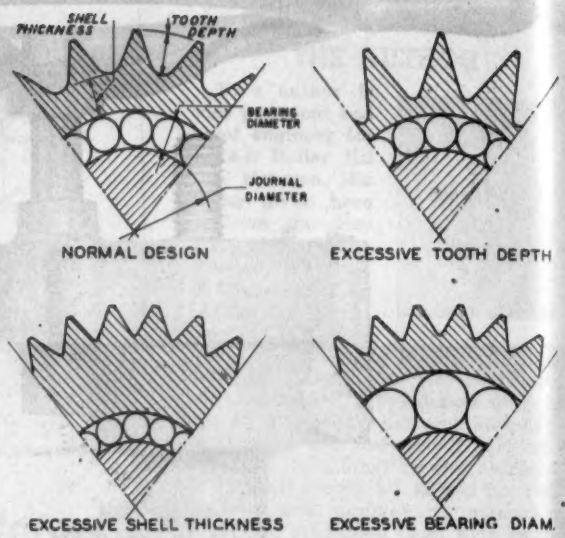


Fig. 3—Effect of excessive tooth depth, shell thickness, and bearing diameter on rock-bit cutter design

"Ideal" Design

Bit manufacturers often called upon to furnish the ideal weight and rotary r.p.m. for rock bits; but due to so many variables, including the human variable, it is impossible to set down in chart form the weight and rotary r.p.m. which will produce the greatest drilling efficiency in any formation. In obtaining laboratory data, it was necessary to have a drilling machine capable of producing wide variations in drilling weights and rotary r.p.m. and to drill in a formation of uniform hardness. In the laboratory, all variables can be controlled within reasonable limi s, and pertinent data can be accumulated. It must be borne in mind that data of this nature are limited in their scope because actual field conditions cannot be duplicated in the laboratory. The data obtained applies only to the rigid conditions under which the experiments were conducted. However, attention is called to the consistency of the trends found in the laboratory curves, and from this one fact it is felt that a pattern can be established for varied drilling conditions.

For our experimental work we chose hard formation standard production rock bits in the 6¾-in. size. The formation selected was granite obtained from a quarry near Llano, Tex. The drilling machine was capable of producing a load of 100,000 lb. on the bit and a rotary speed of 500 r.p.m. maximum. Clear water was used as the drilling fluid. A new bit was used to drill 2 ft. of hole at a given weight and r.p.m. After all 2-ft. drilling tests were completed, the bits were then rerun until they were completely dulled in order to determine the life expectancy of the bit under each drilling condition.

The curves shown in Fig. 4 are the first steps taken in the laboratory to accumulate the data necessary to arrive at the optimum weight and rotary r.p.m. to produce maximum drilling efficiency. They plot the rate of penetration of a bit in feet per hour vs. rotary r.p.m. under constant loads applied to the bit. Each curve is intend-

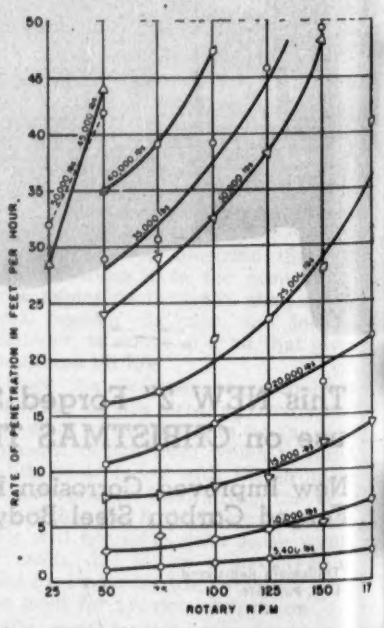
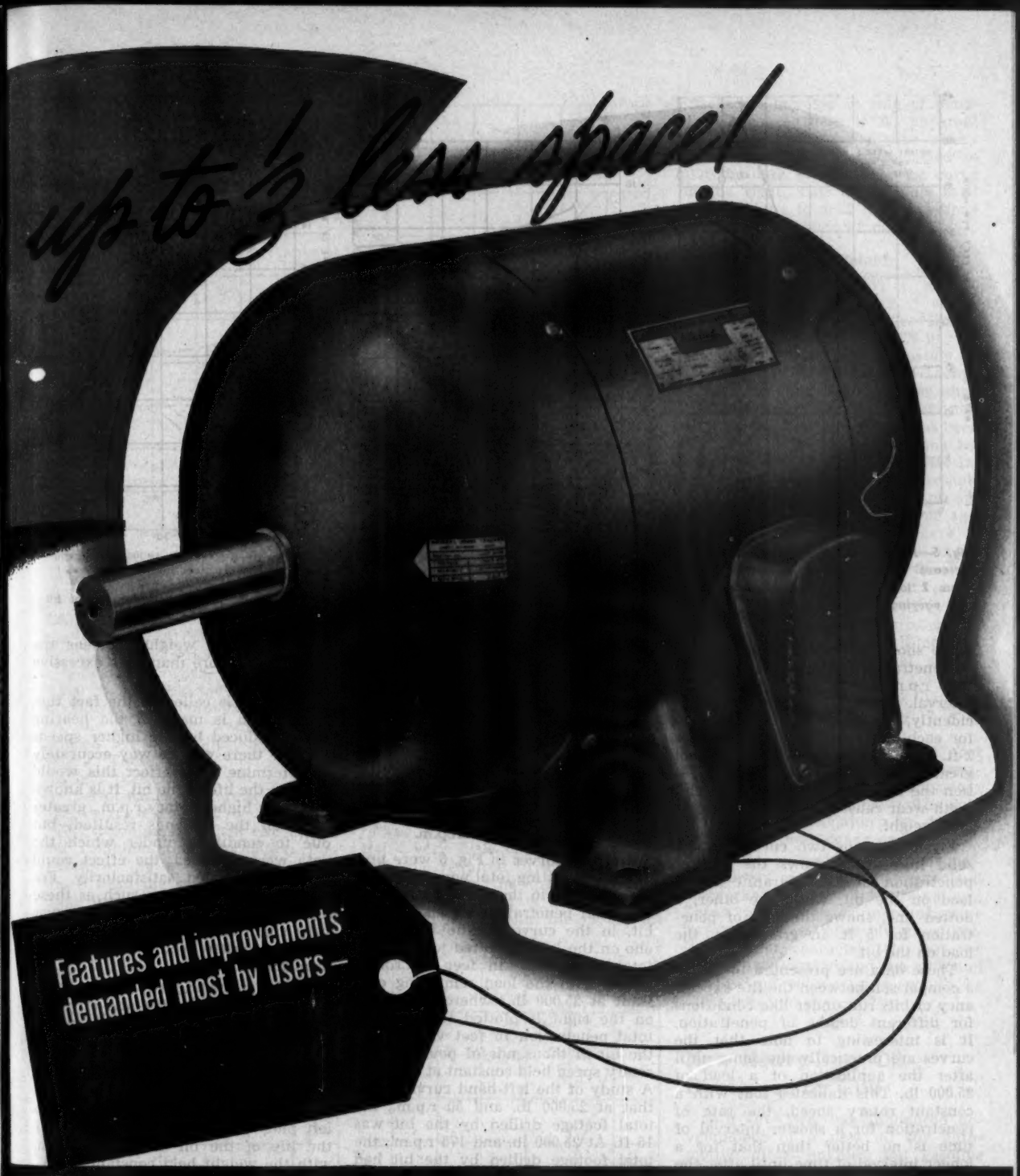


Fig. 4—Effect of rotary r.p.m. variations on rate of penetration. Determined by drilling 2 ft. in granite at constant loads



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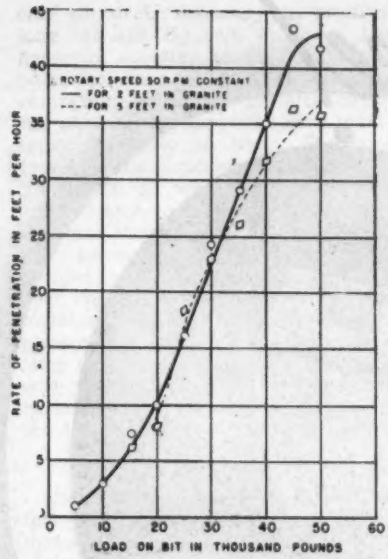
ROTARY SPEED 50 R.P.M. CONSTANT
— FOR 2 FEET IN GRANITE
--- FOR 5 FEET IN GRANITE
RATE OF PENETRATION IN FEET PER HOUR
LOAD ON BIT IN THOUSAND POUNDS

Fig. 5—Effective in rate of penetration, or increase in amount of formation drilled (from 2 to 5 ft. at constant rotary r.p.m. and varying loads)

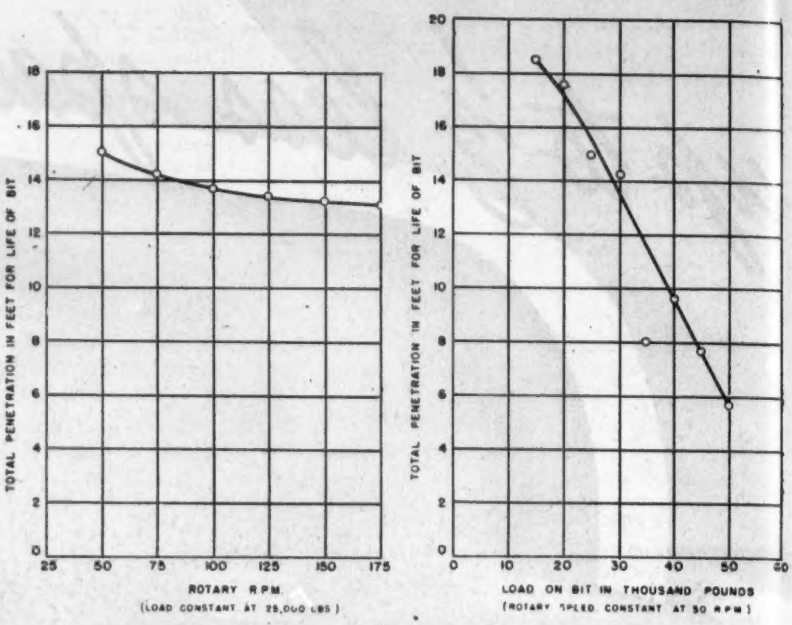
TOTAL PENETRATION IN FEET FOR LIFE OF BIT
ROTARY R.P.M.
(LOAD CONSTANT AT 25,000 LBS.)
TOTAL PENETRATION IN FEET FOR LIFE OF BIT
LOAD ON BIT IN THOUSAND POUNDS
(ROTARY SPEED CONSTANT AT 50 R.P.M.)

Fig. 6—Effect of rotary r.p.m. and load variations on total penetration, for life of bit

ed to show the variation in the rate of penetration for each change in rotary r.p.m., when timed for a 2-ft. interval. It should be mentioned incidently, that the rate of penetration for each change in rotary r.p.m., for 2-ft. increments of drilling, was not great enough to bring into consideration the effect of tooth breakage and tooth wear caused by excessive r.p.m. and weight.

Fig. 5 contains two curves—one a solid line which shows the rate of penetration for 2 ft. in granite vs. the load on the bit, while the other, a dotted line, shows the rate of penetration for 5 ft. in granite vs. the load on the bit.

These data are presented to obtain a comparison between the life expectancy of bits run under like conditions for different depths of penetration. It is interesting to note that the curves are practically the same until after the application of a load of 25,000 lb. This indicates that with a constant rotary speed, the rate of penetration for a shorter interval of time is no better than that for a longer interval of time until after the application of some particular drilling weight to the bit—in this case, 25,000 lb. After this point is passed, the rate of penetration for the longer interval begins to drop off, due to excessive tooth breakage and premature dulling of the cutter teeth. This, of course, clearly illustrates that to maintain maximum rate of penetration for the longest period of time, the bit must not be overloaded to the extent that tooth breakage occurs. Here we have the first indication of an optimum weight for maximum drilling efficiency.

The question often asked is: "Which has more effect on the life of a rock bit, variation in rotary r.p.m. or variation in weight?" The answer to this question has a direct bearing on the topic of discussion; namely, the selection of the optimum rotary speed and load to produce the maximum drilling efficiency. In an effort to answer this question, the curves in Fig. 7 have been prepared.

Penetration vs. R.p.m.

The two curves in Fig. 6 were prepared by plotting total penetration vs. rotary r.p.m. in the curve on the left, and total penetration vs. load on the bit, in the curve on the right. The one on the left is plotted to show the total penetration in feet vs. rotary r.p.m., with the load remaining constant at 25,000 lb.; whereas, the one on the right is plotted to show the total penetration in feet vs. load on the bit in thousands of pounds, with rotary speed held constant at 50 r.p.m. A study of the left-hand curve shows that at 25,000 lb. and 50 r.p.m., the total footage drilled by the bit was 15 ft. At 25,000 lb. and 175 r.p.m., the total footage drilled by the bit had dropped to 13 ft. The effect of increasing the rotary r.p.m. under constant load from 50 to 175 r.p.m., resulted in a decrease of the total footdrilled of 13 per cent.

The right-hand curve presents a more drastic reduction in total penetration of the bit as the load is increased. This decrease amounts to 69 per cent, with a load increase of from 15,000 to 50,000 lb. Reduction in total penetration was due to a more rapid dulling of the cutter teeth under the heavier loads. From this laboratory information it is indicated that the answer to our question is that excessive drilling weight shortens the life of a bit more than does excessive rotary r.p.m.

Attention is called to the fact that no mention is made of the bearing wear produced by the higher speeds because there was no way accurately to determine what effect this would have on the life of the bit. It is known that with higher rotary r.p.m., greater wear on the bearings resulted; but due to conditions under which the data were obtained, the effect could not be correlated satisfactorily. For short intervals of time, such as these bits were run, the bearing wear was very slight and the results indicated that the cutter teeth were affected primarily.

In the preceding two curves data were presented to show the effect of variation in rotary r.p.m. and weight on the total penetration of the bit in feet. The two curves in Fig. 7 show the effect of these variations on the rate of penetration for the life of the bit in feet per hour. The curve on the left plots the rate of penetration for the life of the bit vs. rotary r.p.m. with the weight held constant at 25,000 lb. This curve was prepared by running six bits at rotary speeds varying from 50 to 175 r.p.m. It is interesting to note that at 50 r.p.m. and 25,000 lb. load the over-all rate of penetration was approximately 16 ft. per hour, while at 175 r.p.m. and 25,000-lb. load, the over-all rate of penetration had increased to 25 ft. per hour. Under these conditions, this wide variation in rotary speed increased the rate of penetration only 69 per cent.

The curve on the right was plotted to show the rate of penetration for the life of the bit vs. the load on the

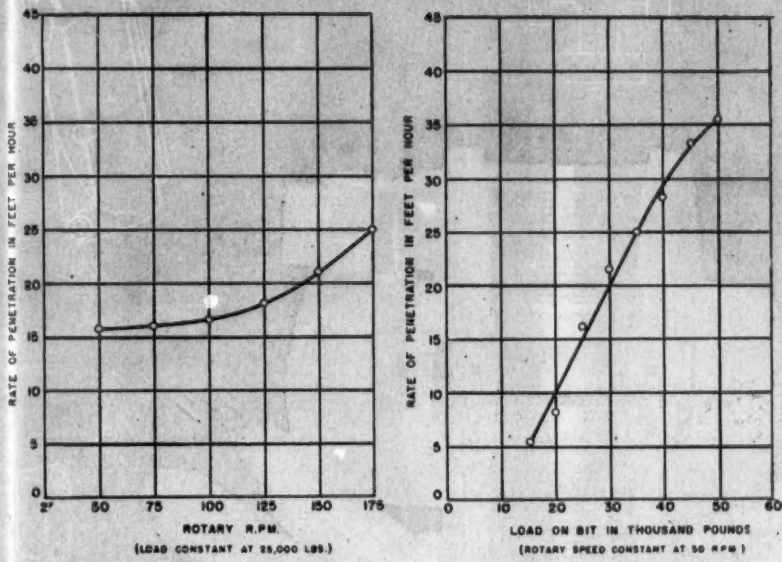
RATE OF PENETRATION IN FEET PER HOUR
ROTARY R.P.M.
(LOAD CONSTANT AT 25,000 LBS.)
LOAD ON BIT IN THOUSAND POUNDS
(ROTARY SPEED CONSTANT AT 50 R.P.M.)

Fig. 7—Effect of rotary r.p.m. and load variations on rate of penetration, for life of bit

bit in thousands of pounds, with the rotary speed held constant at 50 r.p.m. It will be noted that an increase in the rate of penetration of 700 per cent is indicated between the bit run at 15,000 lb. and the one run at 50,000 lb. However, as previously pointed out, the life of the teeth is greatly reduced by the application of more weight. These curves also point to the fact that drilling weight affects the performance of a rock bit more than rotary r.p.m.

Fig. 8 contains the last two curves and combines the information presented in the preceding six curves into a form that illustrates the optimum rotary r.p.m. and weight for maximum drilling efficiency in a given formation. For Fig. 8 a hypothetical case was assumed and data presented in previous curves were applied, to arrive at a time required to drill 100 ft. of formation, (in this case, granite) taking into account the total life of the bit and the trips necessary to change bits. The curve on the left plots total time in hours to drill 100 ft. vs. rotary r.p.m. This curve was arrived at by running bits at a constant load of 25,000 lb., varying the rotary r.p.m. It will be observed that under laboratory conditions, very little change is noted in the time required to drill 100 ft. of hole by varying the r.p.m. This means that, as the speed is increased, the reduction in the total life of the bit

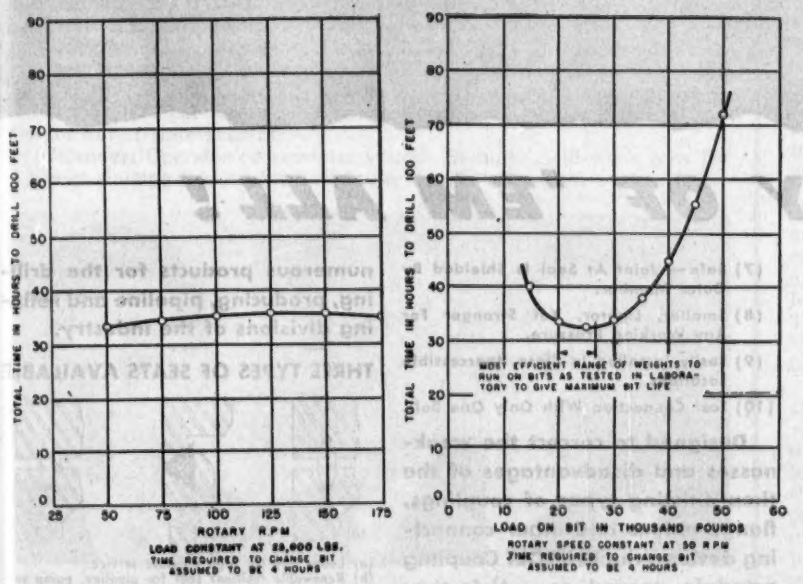
TOTAL TIME IN HOURS TO DRILL 100 FEET
ROTARY R.P.M.
LOAD CONSTANT AT 25,000 LBS.
TIME REQUIRED TO CHANGE BIT
ASSUMED TO BE 4 HOURS
MOST EFFICIENT RANGE OF WEIGHTS TO RUN ON BITS AS TESTED IN LABORATORY TO GIVE MAXIMUM BIT LIFE
LOAD ON BIT IN THOUSAND POUNDS
ROTARY SPEED CONSTANT AT 50 R.P.M.
TIME REQUIRED TO CHANGE BIT
ASSUMED TO BE 4 HOURS

Fig. 8—Rotary r.p.m. and load variations on drilling efficiency of rock bit, in time to drill 100 ft. of hole

offsets the increase in rate of penetration. Since there is no apparent gain in economy by higher rotary r.p.m., a low speed was selected to plot the data presented in the curve on the right. This curve plots total time in hours to drill 100 ft. vs. load on bit in thousands of pounds.

Correct Weight

For example, at 15,000 lb. and 50 r.p.m., the total time arrived at for drilling 100 ft. was 40 hours. In the ranges of from 20,000 to 26,000 lb., the time required was approximately 32 hours, which is a substantial saving. It is seen that loads greater than 26,000 lb. indicate a reduction in economy. By the time the weight has been increased to 50,000 ft., the time required to drill 100 ft. of hole has increased to 72 hours. which represents an increase in drilling time of approximately 125 per cent. From this curve it is seen that somewhere in the range of 20,000 to 26,000 lb. is the correct weight to apply to the bits, tested in this experiment.

It is not intended to convey the thought that the same figures can be applied directly to field drilling conditions, but it is felt that similar weight and rotary r.p.m. combinations can be worked out in the field that will give results similar to these presented.

In conclusion, it is stressed that these data apply only to the formation tested and under the laboratory conditions mentioned above. The data present a definite pattern for drilling only under these conditions.

It is the author's opinion that similar curves of definite pattern could be worked out for other formations. Softer formations or more abrasive formations would probably give slightly different characteristics, but the pattern would exist and the optimum weight and rotary r.p.m. would be indicated.

New Heavy-Duty Oil Developed by Gulf

Gulf Oil Corp. has announced development of a new oil for automotive diesel engines and gasoline engines operating in extra heavy-duty service.

The new product, named Gulflube H.D. motor oil, combines the advantages of full detergency and the tough film qualities of paraffin base, according to a company announcement. The full detergent characteristic in automotive diesel use assures cleaner engines, avoiding high-temperature sludge, lacquer, and stuck rings. In extra heavy-duty gasoline engines it also avoids deposits and ring sticking due to oxidation. The oil, which contains Gulf's antifoam agent, has been made entirely noncorrosive, the announcement said.

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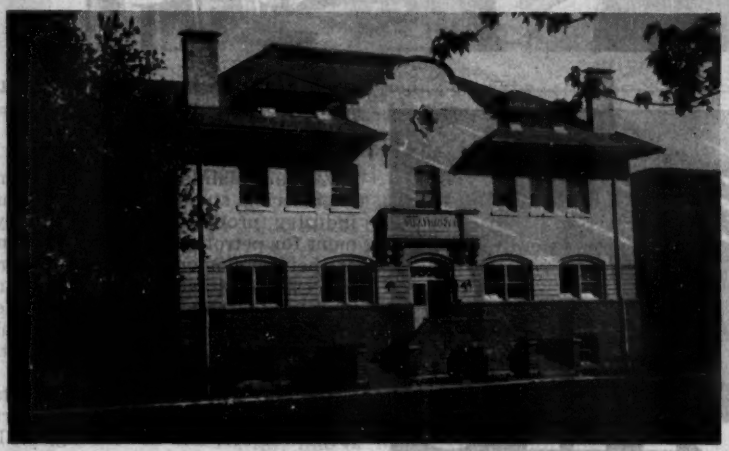

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SALIENT FACTS AND FIGURES

General: State controlled, coeducational, financed by small private endowment plus state mill levy and royalty from mineral production. Income of around $400,000 per year. Located in Golden at base of Front Range, about 50 miles east of main range of Rocky Mountains—12 miles from Denver. Managed by a five-man board of trustees.

History: In 1868, Bishop George M. Randall made provision for a school of mines when he established his Episcopal University. The territorial legislature made its first appropriation in 1870 for a building for the Randall school. The Colorado School of Mines was legally established by territorial assembly in 1874, and absorbed Episcopal University.

Grounds: Main campus consists of 50 acres with 11 buildings. Three off-the-campus field camps are run by the school. Geology-petroleum field camp has 15 sections of land in Wild Horse Park, near Pueblo.

Tuition: $35 per semester for Colorado students and $125 per semester for out-of-state students.

Calendar: Operates on semester system. Summer field work runs for 6 weeks starting first of June. Summer session after field work.

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COLORADO School of Mines is the oldest institution in the United States devoted exclusively to the training of engineers for the mineral industries. A degree of petroleum engineer is offered by the school for undergraduate work in either petroleum production or refining.

Clark F. Barb (P.E. and M.S., Colorado School of Mines) is head of the petroleum production engineering department, and James O. Ball (B.S. and M.S., University of Colorado) is head of the petroleum refining. M. I. Signer is dean of engineering. The petroleum faculty, in addition to Barb and Ball are: George W. Le Maire (P.E., Colorado School of Mines) assistant professor; Hugo H. Geissler (B.S. in Ch.E., Armour Institute), assistant professor; and Arthur W. Buell (E.M. and M.S., Colorado School of Mines), instructor. President of "Mines" is Dr. Ben H. Parker.

Field and Laboratory Work

Campus laboratory equipment includes, in addition to the usual apparatus for petroleum testing, a vacuum fractionating column for the higher-boiling portions of petroleum, and a smaller column for evaluating gasoline and kerosine fractions. One laboratory section is for the measurement of gases and calibration of meters. Small-scale models are used to familiarize the student with construction details of actual equipment. The production laboratory is equipped for the testing of oil sands, drilling muds, and other production problems.

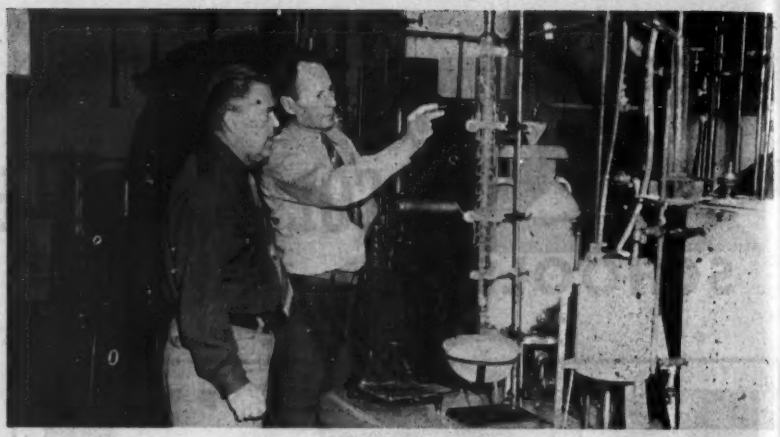
A nationally known collection of well samples for study by students and visiting geologists is actively maintained in Berthoud Hall. There are samples from about 1,500 wells located in the Rocky Mountain region. The collection also contains a number of electric logs of Rocky Mountain wells.

For petroleum-production students, at the end of their junior year, a 6-week summer field camp is conducted in Rangely field. For petroleum-refining majors, at the end of their junior year, a 6-week full-time oil-testing laboratory course is conducted on the campus. During the junior and senior years, required inspection trips are taken to nearby oil fields, refineries, and other plants of interest in the petroleum industry.

The members of the senior class, both in the production and refining option, are required to make an inspection trip to one of the oil districts of the United States. This trip is made at the end of the senior year and requires from 10 days to 2 weeks.

The U. S. Bureau of Mines maintains a $150,000 field station on the campus with a full-time staff of six engineers and technologists. Work of this station includes development of methods for carbonization and complete gasification of coal. Students assist in this work on a part-time basis.

Three teaching or research fellowships offering up to $1,200 and tuition



Clark F. Barb (right) and George W. LeMaire inspect fractionating equipment in petroleum laboratories at Colorado Mines

a year are maintained for petroleum-engineering students. The petroleum industry provides summer employment for petroleum majors at the end of their sophomore and junior years. The estimated average starting salary of a 1947 graduate with a P.E. degree was $275, including living allowance. This compares with an estimated salary of $135 in 1941.

For the school year 1946-47, total enrollment in the production department was 169, and in refining, 78. In 1940-41, the last prewar school year, there were 125 enrolled in production and 68 in refining. Enrollment figures by classes in the production department this past school year were: freshman, 61; sophomore, 54; junior, 34; senior, 15; and graduate, 5. Class figures for refining were: freshman, 25; sophomore, 27; junior, 15; senior, 10; and graduate, 1.

Details of Course

In addition to the laboratory work and field trips discussed above, the curriculum includes the following specialized undergraduate petroleum courses: (Figures in parenthesis are credits—divide credits by three to obtain semester credit hours) drilling (6), unit processes (9), petroleum refining (9), petroleum production (11), fluid transfer (10), synthetic oils and fuels (12), hydrocarbon conversion processes (6), production management and valuation (11), gasoline plants (4), and refinery engineering (18).

Specialized graduate courses include: advanced production (3-6), advanced refining (3-6), advanced production (second semester) (3-6), oil industry of the Rocky Mountain district (3-6), seminar (2).

Petroleum students may aspire for membership in three honorary fraternities—Tau Beta Pi (engineering scholarship), Theta Tau (professional engineering), and Sigma Gamma Epsilon (mining and geology). The American Institute of Mining and Metallurgical Engineers has a student chapter on the campus.

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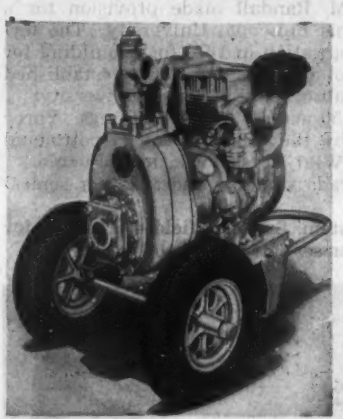

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Engineering Characteristics of the Gulf Coast Continental Shelf

Presented on this and following pages is high point material on three reports concerned with important features of offshore drilling. With the big push in looking for new oil areas on the U. S. Continental Shelf, offshore drilling is a live current exploration-drilling subject.

by M. B. Willey*

THE Louisiana Continental Shelf is a submarine area which extends seaward for as great a distance as 100 miles off the present shoreline. The gulf bottom in this region is characterized by low slopes and its outer margin is outlined by the 50-fathom (300 ft.) contour. South of the margin of the shelf the slopes steepen abruptly in the continental slope zone and plunge into the deeps of the Gulf of Mexico.

The engineer who is called upon to design a structure located on this shelf is concerned only with the uppermost portion to a depth generally not to exceed 100 to 150 ft. This layer is very young in a geological sense, and it has the characteristics usually associated with infancy. A few of these are lack of strength, lack of uniformity, and high water content. It consists of the sedimentary deposits of the various rivers and streams entering the gulf. These streams are all heavily burdened in quantities sufficient to fill the areas at their mouths, were it not for the fact that continual subsidence, equal or greater in amount and acting directly opposite, prevail over the sedimentary workings of the streams. This subsidence has been estimated by geologists to be at the rate of at least 1 ft. per century.

Recent Alluvium

The sediments of the Mississippi (augmented, to a small extent by the other small rivers and streams) are the materials of the Continental Shelf along the entire coast of Louisiana. This huge mass of stream deposits is known as the Recent alluvium and "consists of a sequence of sediments which grades irregularly upward from course, graveliferous sands into progressively finer deposits of sands, silts, and clays."[1] It overlies the Pleistocene in depths varying along the coast line, from a few feet at the western edge of Louisiana, to as much as 350 ft. and more in the area south of Houma and New Orleans.

The upper or nongraveliferous section of this Recent alluvium consists of sands, silts, and clays having a maximum known thickness of over 250 ft. near the gulf shore south of Houma. The outcropping of the Pleistocene can be taken to be at or near the interior edges of the coastal swamps.

In this country the standard classification of materials, as found in sedimentary deposits, is that of the Bureau of Soils of the U. S. Department of Agriculture. It is as follows:

Name—	Size of particles
Colloids	less than 0.001 mm.
Clay	0.001 to 0.005 mm.
Silt	0.005 to 0.05 mm.
Very fine sand	0.05 to 0.1 mm.
Fine sand	0.1 to 0.25 mm.
Medium sand	0.25 to 0.5 mm.
Coarse sand	0.5 to 1.0 mm.
Fine gravel	1.0 to 2.0 mm.

We may rest assured that most structures erected on the continental shelf adjacent to the coast of Louisiana must depend for support on such materials, with an occasional intermingling of a layer or deposit of humus or shell. In general, but not always, they will be more consolidated at the deeper depths and the water content will be lower.

Piles for Supports

Up to the present time, the only structures erected offshore in the Gulf of Mexico have been those required for the drilling of exploratory oil wells and in all cases these have used piles to support the elevated platforms. As would be expected, the results of the driving of test piling in these various locations show considerable variation. All are in the area in which the Recent alluvium is thick and it is certain that in none of them have piling reached the Pleistocene. The resistance supporting these piles is due to the friction of the earth against the side of pile, with little or no assistance from actual bearing at the point. Fortunately, the silts, clays, and sands of these sedimentary deposits have a fairly high shearing value and, what is even more fortunate, they possess the ability to set or freeze around the pile after it has remained in place for a period of time.

There has been little, if any, use of soil mechanics in the design of offshore structures up to the present time. This science, which in recent years has attained full recognition as an important branch of engineering, can be profitably employed in preliminary investigations of structures to be built on the continental shelf. An examination of the materials encountered to determine water content, clay content, water-plasticity ratio of clays, cohesion in silts and clays, and other tests made by qualified soil technicians can provide a close check of the results of driving and load tests, and discover unconformities in the various layers which would lead to a correct determination of piling lengths and give other assistance to the proper solution of the problem. After the erection and use of the first structure in any given area, additional installations can no doubt be safely designed by the correlation of test borings in conjunction with the driving of a single test pile.

Different Set of Conditions

The above remarks have applied specifically to the Louisiana Continental Shelf inasmuch as all offshore exploratory drilling has, so far, been concentrated in this area. Apparently, conditions similar to those encountered adjacent to Louisiana will apply along the coast of Mississippi and Alabama. However, as we continue into the extensive shelf off Florida we enter an area very different. Here the surface is largely sand, shell, and coral and the bearing capacities will be much greater. If coral is encountered, as in one location made offshore of the Florida Keys, the full strength of the piling acting as a column will be developed.

The remaining portion of the Gulf Coast Continental Shelf—that part bordering Texas—varies considerably from the others, at least insofar as surface conditions are concerned. At the southern extremity the Continental Shelf is much narrower and steeper, in fact along practically the entire Texas coast the slope of the shelf from the shore to the 30-ft. depth contour is much sharper than is general elsewhere. The upper layer of the Pleistocene in this area consists of clay and marl, interbedded with lentils of clay. Along the coast it is reached at comparatively shallow depths, usually about 6 to 10 ft.

References

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3. Terzaghi, Charles—"The Science of Foundations" published in the "Transactions of the A.S.C.E.," Vol. 93-1929.

*Chief engineer, J. Ray McDermott & Co., Inc., Harvey, La. Portion of a presentation at the Tulsa A.I.M.E. meeting, October 8-10, 1947.

MARINE CONSTRUCTION

Some Important Considerations

by F. R. Harris* and H. G. Knox†

WAVES in the open gulf may at times reach a height of 25 ft. and a length of 600 ft. In 100 ft. of water or less waves will probably seldom, if ever, exceed 20 ft. in height with a length of approximately 350 ft. Even this size of wave will be exceptional. It is usually assumed that two-thirds of the wave height is above the still-water line and one-third below so that the crest of a 20-ft. wave will rise about 13 ft. above the still-water level and the trough will sink about 7 ft. below it.

The deck of an open structure erected offshore in the gulf should therefore be raised at least 20 ft. above the still-water line. The impact of green sea waves upon any structure exposed to them can be tremendous.

Types of Offshore Structures

The terrain first facing exploitation we understand lies off the Louisiana and Texas coasts from the mouth of the Mississippi River to Brownsville, Tex. It is hard to predict to what sea depths well drilling may ultimately proceed, perhaps up to 120 ft. or more, but it is almost certain that the first efforts will lie within 60 ft. of water. As an indication of the gulf area involved the following tabulation is pertinent:

DISTANCE OFFSHORE TO 10 AND 20-FATHOM CONTOURS

Location—	In nautical miles— 10-Fathom	20-Fathom
Brownsville	4	15
Corpus Christi	5	20
Matagorda Bay	10	27
Galveston	25	50
Port Arthur	35	65
Atchafalaya Bay	35	48
Terrebonne Bay	20 to 10	32
West Side Miss. Delta	8	16

*President and †vice president of Frederic R. Harris, Inc., New York City. A portion of the presentation made at the Tulsa A.I.M.E. meeting, October 8-10, 1947.

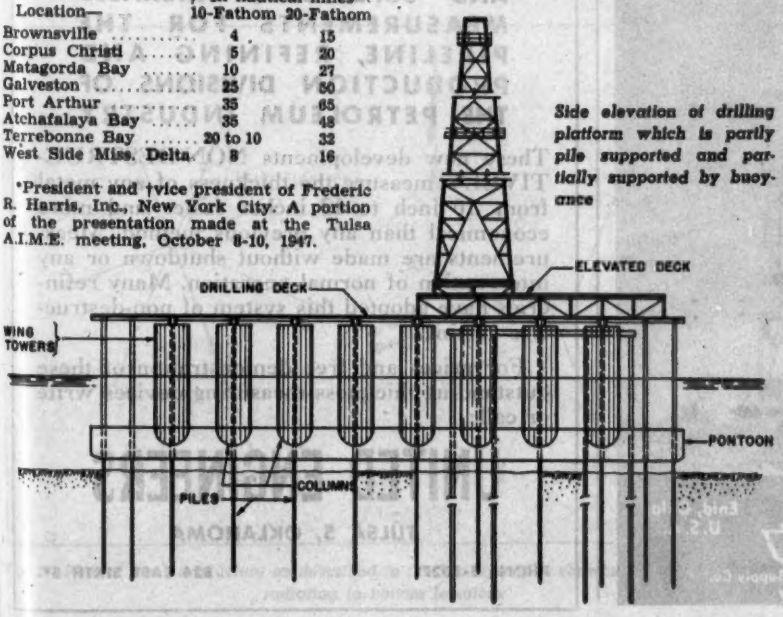
The offshore area between the shore line and the 10-fathom curve from the Mississippi Delta to the Rio Grande represents an area of about 11,000 sq. nautical miles.

Fixed Drilling Platforms

The first form of drilling platform which suggests itself for use close inshore is the sheet pile cofferdam carried up to a level well above storm waves. This form of artificial island may have its uses in water up to a depth of about 25 ft., preferably where the work of construction can be carried on behind some protected headland or reef.

A second type of structure which may find some uses in open gulf waters is the conventional type of platform supported on piles of wood, concrete, or steel. It will be a time-consuming and costly structure. Much will depend upon the weather encountered and the weight, mooring, and other seagoing qualities of the equipment used.

Both the cofferdam and the pile-supported platform contemplate the transportation of piles and other structural material to the site piece by piece and assembly under whatever weather conditions exist from day to day throughout the construction period. The drilling equipment and machinery will also have to be landed on the platform from rolling barges piece by piece and installed at sea. Whatever fabrication work can be done ashore or in sheltered water and transported to the site in assembled form will reduce the handicaps of foul weather.



Side elevation of drilling platform which is partly pile supported and partially supported by buoyance

In one of the oil trade journals recently we read of the installation of a heavy platform transported to the site in relatively large preassembled units. The piling was carried in rigidly cross-braced tubular jackets ready to be dropped and driven, and the prefabricated units were transported and placed in position by conventional flat-deck and derrick barges. This certainly seems a step forward along practical and economic lines and the 9-day pile-driving period exemplified the reduction in field work.

Fixed and Buoyant Platforms

Another phase is the possible use of drilling platforms which are partially pile-supported and partially supported by buoyancy. These combination structures naturally fall into two groups; first, those in which the entire drilling deck is partially supported by piling and partly by buoyant pontoons. The second type is one in which the deck carrying the essential drilling equipment is a fixed-supported platform while many of the accessories are carried nearby on a floating structure where wave motion is not too objectionable.

A platform of the first type has been carried fairly well along in the design stage and presents one solution to the offshore drilling problem (see figure). The rig consists of a heavily constructed drilling deck of whatever size is deemed necessary for accomodating the drilling equipment, the necessary supplies and the crew. The deck is carried permanently on hollow tubular columns and towers by heavy submersible pontoons constructed on the principles of a floating dry dock. The columns contain steel piles and the towers supply the needed stability, at the same time forming useful storage tanks. The rig is erected in a sheltered harbor and all of the major items of equipment installed.

The lift of the buoyant pontoons which remain with the structure during the entire drilling period is adjusted by expelling ballast water to carry a large portion of the weight of the structure. Under these conditions, the number of piles can be based upon the requirements of holding the rig in position against the action of the sea rather than by the requirements of supporting the weight of the drilling deck entirely on piling.

Deep-Water Platforms

The devices which have been mentioned are all considered as applicable to sea depths of 60 ft. or less. The time may well arrive when drilling in still greater depths of water may be demanded.

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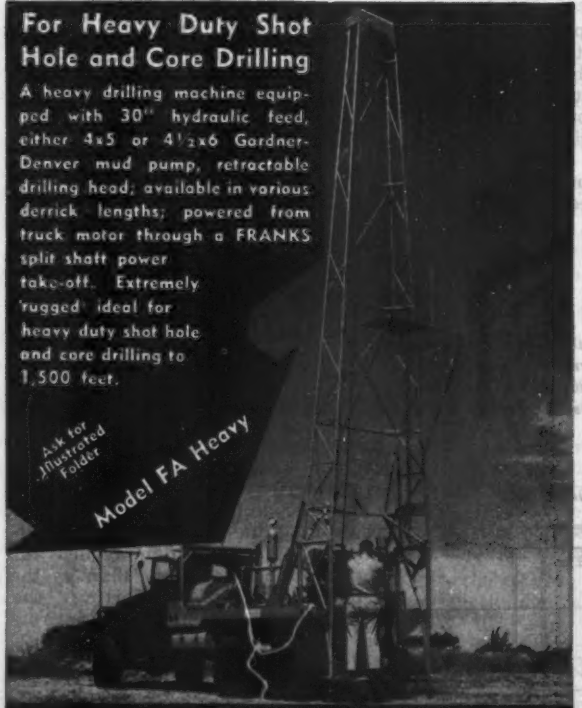

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Planning Multiple-Well Directional-Drilling Program for Offshore Locations

by John G. Jackson and J. B. Murdock, Jr.†*

THE following example illustrates one solution to the problem of planning a multiple-well directional-drilling program for offshore locations with the geological, mechanical, well spacing, and marine-structure conditions given. Although it undoubtedly is not the only possible manner in which the planning can be done, it is a practical solution. It allows for the use of the data previously discussed. Assumed conditions are as follows:

Geological.—Oil structure is nearly horizontal. There is not enough dip to affect well spacing.

Oil structure considered to be sufficiently productive to warrant economic production on one well to forty acre spacing.

Top of oil sand is at 8,500 ft. vertical depth. Thickness of productive zone is 250 ft.; therefore, terminal depth is 8,750 ft. vertical depth approximately. There is no evidence of an oil zone below this depth.

Formation to be penetrated: unconsolidated—surface to approximately 500 ft.—balance is sand, shale, and sandy shale with numerous hard shells at points between 1,400 and 1,625-ft. depths. Lime formation occurs from 6,850 to 7,250 ft. vertical depth (400 ft. thick). Rock bits must be used in the latter stratum.

Mechanical.—Casing program:

13⅜-in. casing 0 to 800 ft. vertical depth
7-in. casing 800 to 8,500 ft. vertical depth
5-in. liner in oil zone

Hole sizes to be:

17-in. from 0 to 800 ft. vertical depth
10⅝-in. from 800 ft. to terminal depth.

Drilling equipment is adequate to penetrate to depth specified. Four and one-half-in. full-hole drill pipe is to be used in conjunction with directional drilling surveying type bits and nonmagnetic drill collars.

Wells to be drilled are expected to flow. It is contemplated that oil produced will be pumped to storage on mainland through submarine lines.

Well spacing.—Spacing will be 26 ft. center to center of casing heads of completed wells.

Island structure can be situated so that courses of directional wells will radiate from marine structure without necessity of crossing each other.

Marine structure.—Structure is located in the open sea about 2 miles offshore where the depth of water is 20 ft. at low tide. Tidal range is about 8 ft.

The drilling island is presumed to be a steel sheet-pile structure (coffer dam) tied across with steel tie rods. Earth fill is made inside the sheet-piling with a bearing pile mat structure of sufficient strength to support oil derricks. Erosion at the base of the structure is minimized with heavy stone riprap. Structure will be rectangular in shape with 72 by 150 ft. top surface. This will accommodate 10 wells on spacing previously specified.

Power-generating units, pipe racks, mud pits, bunk houses, etc., will be installed on barges moored alongside the island.

Directional drilling.—Increase of drift is to be not over 2° 30′ per 100 ft. drilled. Maximum dog leg will not exceed 2° 30′ in 50 ft. or 5° in 100 ft.

The type of well chosen will be one which increases in drift at a uniform rate to the maximum and maintains this angle to bottom. Although it is anticipated that wells should flow in their early life, when pumping is necessary fluid pump and sucker rods will be in alignment. By penetrating oil zone at the maximum drift angle more productive sand will be exposed.

Solution of Example

The proposed bottom locations of the wells are laid out on 1,320-ft. centers (40-acre spacing); the site of the marine structure is chosen so that one well in the group may be drilled straight. (See Fig. 1, Well No. 8.)

Since the geological formation is practically horizontal, bottom locations are selected which separate the horizontal courses of the wells as much as possible. (See Fig. 1.) The true bearing and distance from the surface location to bottom of each well are next scaled or computed. The middle point of the thickness of the oil zone (8,625 ft. vertical depth) is used as the bottom of the well when the well spacing is planned.

It has been proved through experience in directionally drilled wells that the maintaining of drift angles of less than 15° makes accurate control of the well course very difficult. Hence the maximum angles of all wells should be greater than 15°.

Bearing in mind that the weight of drill pipe (and sucker rods when the well is pumped), as well as the rate of increase in drift per 100 ft. drilled

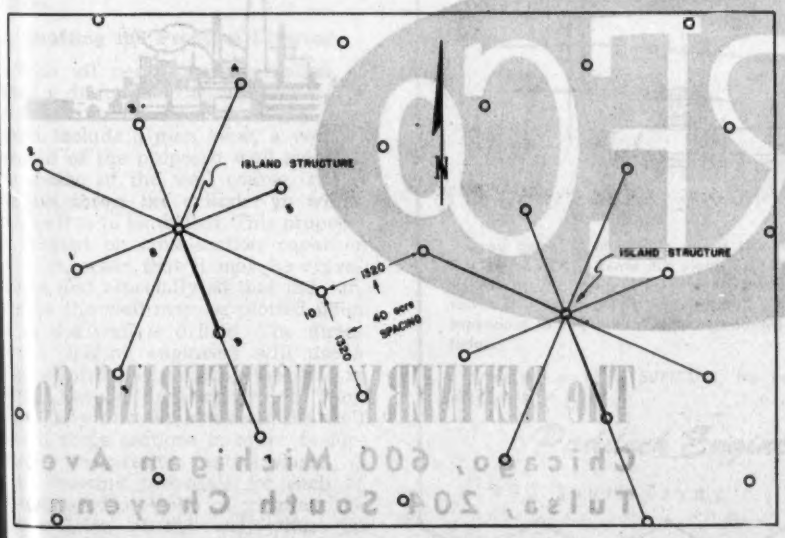

Fig. 1—Plan of marine structure as described in the text example, showing directional wells radiating to bottom locations

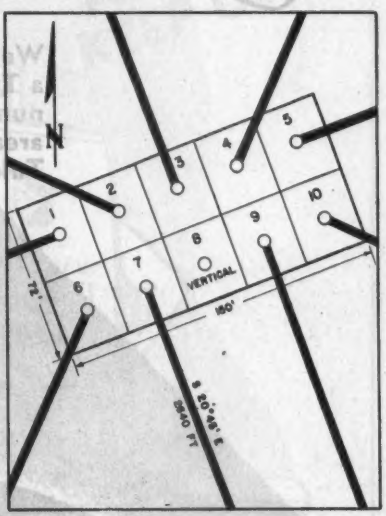

Fig. 2—Detail of island showing surface locations of directional wells

*Vice president and general manager and †chief survey engineer, Eastman Oil Well Survey Co., Denver. Portion of a presentation at the Tulsa A.I.M.E. meeting, October 8-10, 1947.

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below the deflection point, have a direct bearing on the tendency of the drill pipe to key seat (or the sucker rods to wear tubing) the amount of straight hole made before deflecting the well should be as great as possible. Economically, this is advantageous since the straight hole is normally cheaper to drill.

Limiting the last two considerations mentioned above is the fact that it would be preferable to drill straight hole through the shells between 1,400 and 1,625 ft. and the lime stratum between 6,850 and 7,250 ft. or to have the drift increased to maximum before either of these depths is reached. Either solution would eliminate the necessity for doing deflection work in formations not ideal for the setting of deflection tools.

Proposal for Well No. 7

Since each of the nine directional wells (No. 8 is straight) has a different deflection distance to reach its proposed bottom location, each well must be considered separately. In this example then a complete directional drilling plan will be perfected for No. 7 well which requires the greatest deflection. The course of this well is S 20° 45′ E and the distance to the ideally spaced bottom at 8,625 ft. vertical depth (center of the thickness of the oil sand) is just 2,640 ft. (Note: It is considered that the vertical depth has been adjusted for the elevation of the top of the rotary table above sea level.) It will be noted that the direct course of No. 7 well comes very close to the planned course of Well No. 9. Any possibility of the holes coming in close proximity to each other except in their vertical portions can be eliminated by starting deflection at different depths. Obviously it would be most convenient to start deflecting Well No. 7 at a shallower depth than No. 9 since the former well must travel a greater distance.

Drafting the Proposal Drawing

With all necessary information at hand a directional drilling proposal is drafted. A directional drilling proposal include a plan view, a vertical section of the proposed well made in the plane of the well course, and a section across the cylinder in which the well is to be drilled. This proposal is drafted on cross-section paper or cloth in order that it may be reproduced and especially so that the survey of the well may be plotted upon it as the well is drilled. The directional drilling engineers will use a copy continuously during the time in which the well is being drilled. They habitually plot the course of the well on all three sections in order to formulate their future control plans.

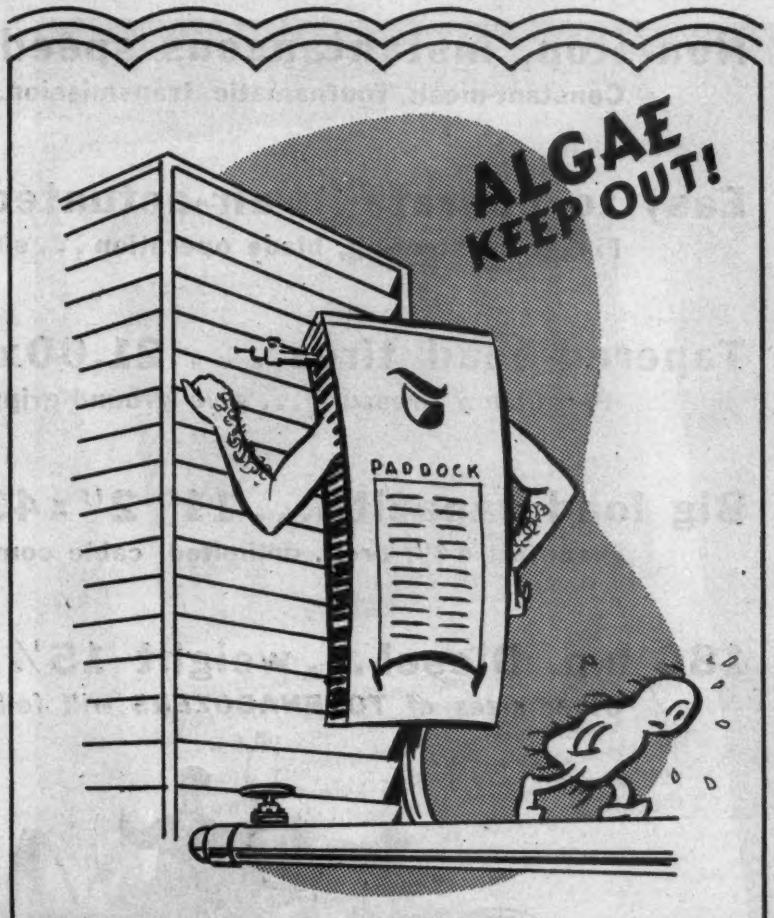
In drawing proposals for each of the directional wells of a group the interrelation of the wells must be considered. The deflected portions of the wells can best be separated by commencing the deflections at different depths. In cylinder drilling if the same rate of increase in angle is used on all wells they will tend to stay separated although they may follow nearly parallel courses. The normal sequence for drilling wells is to drill the lower angled wells first. A major portion of the experience gained in drilling these wells will be of value when those maintaining higher drifts are attempted.

J. P. Hamilton has been made section head of the economic analysis section in the technical-service division, Humble Oil & Refining Co.

Gamma Ray Supersonic Inspection Methods

(Continued from page 103)

Referring to diagrammatical drawing of tangential head (title page), radium source S is fixed in its relationship to point A and flat ground hardened steel anvil. Geometry has been so worked out that the gamma rays passing through the material will result in the thickness of the material at point of contact with anvil being indicated. This is again an average thickness over an area of approxi-



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mately 1 sq. in. Two tangential heads have been designed, one to read pipe of 2 to 8½ in. and one 2 to 12¾ in. The tangential heads may be used in close quarters for reading adjacent to supports and fittings and on curved sections, and are accurate to within 3 per cent. Quick surveys can be conducted to locate buildup of deposits in pipe lines, point of closure, foreign matter lodged, eccentricity of pipe, forgings and castings, etc.

As with the standard head, a curve drawn to read thickness of pipe filled with air cannot be used to measure thickness of pipe filled with a material of different density. In measuring tangentially, part of the gamma rays pass through an area on the interior of the pipe and will be affected by the density of the medium filling the pipe. For a pipe filled with a material of constant density, a curve may be readily made from reading of three or more known pipe wall thicknesses of the same i.d. and filled with material that will then allow the actual reading of unknown wall thicknesses.

Use of the Audigage

The Audigage is used by Continental to supplement the Penetron. Its field of use is on equipment with thicknesses of ¾ to 12 in. such as towers, high-pressure valves, and on equipment inaccessible to the Penetron. The instrument can measure down to thickness of ¼ in., but is generally used only above ¾ in. whics is the top range of the Penetron.

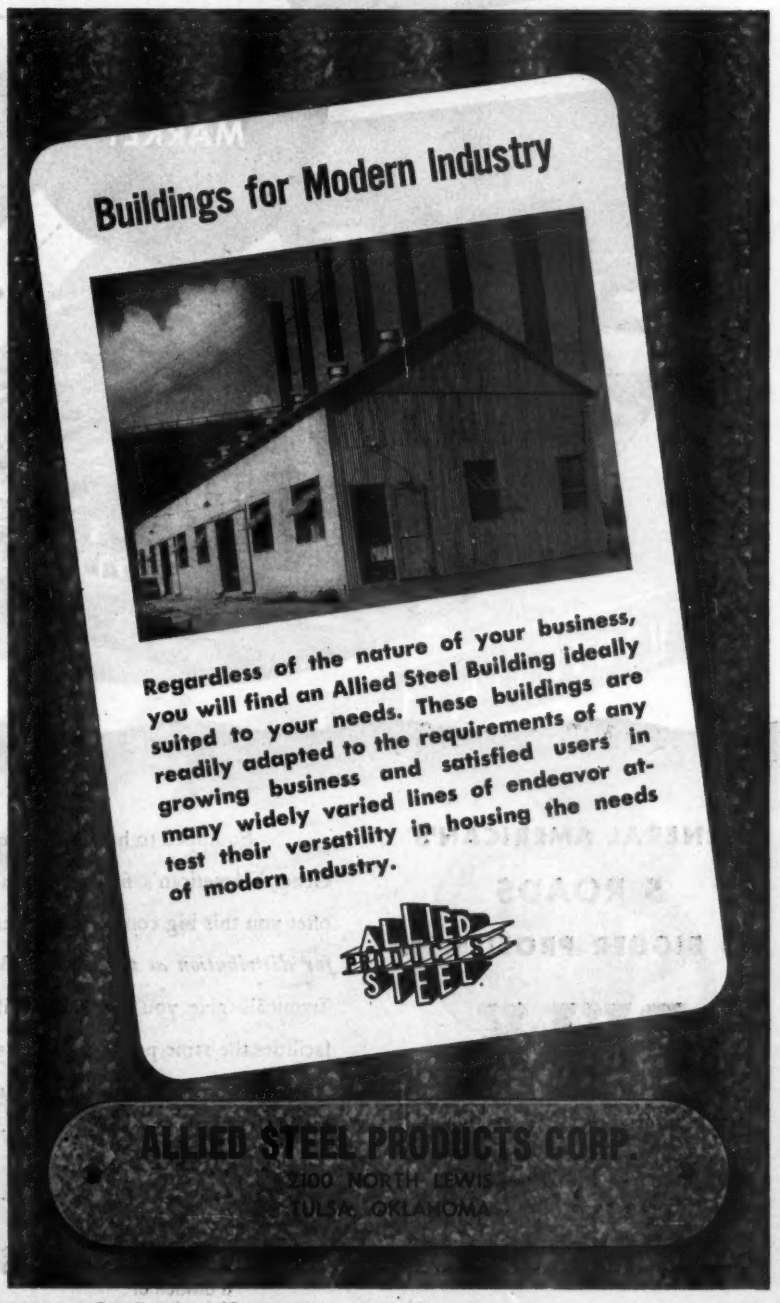
The Audigage measures thickness from one side by determining the fundamental natural frequency of vibration in the thickness direction. The natural frequency of thickness vibration is essentially independent of the other physical dimensions of the material.

A vibrating quartz crystal is placed in contact with one side of the material under test so that a supersonic sound wave is transmitted into the material. This wave travels in a narrow beam through the material and is reflected by the opposite surface. When the frequency of the wave is of such value that the transmitted and reflected waves are in phase, there will be a relatively large increase in the amplitude of the wave in the material. This resonance condition will occur at a fundamental frequency which is inversely proportional to twice the thickness dimension and directly proportional to the velocity of sound in the material. Since the velocity of sound in the material will be a known factor or can be determined by using the Audigage to test a sample of known thickness, the determination of the fundamental frequency required to produce resonance is an accurate and reliable measure of an unknown thickness.

By frequency-modulating the electronic oscillator which drives the quartz crystal, an audible signal is produced at the fundamental frequency and at harmonics of the fundamental frequency. This signal can be heard in a set of headphones. The difference in frequency between any two adjacent signals is measured on a scale which is calibrated in frequency. This frequency difference is always numerically equal to the fundamental frequency. A conversion scale on the instrument panel shows the thickness of steel corresponding to the measured difference in frequency.

Description of the Audigage

The Audigage*, complete with batteries and accessories, housed in a luggage-type carrying case, weight 14 lb. (See Fig. 2.) The cover is removable, and the basic instrument which an operator must carry weighs 10 lb. and is 9 in. wide by 11 in. high by 5 in. deep. Power for the instrument is supplied by batteries which are included in the instrument case. A conversion scale, concentric with the frequency scale, enables the operator to read steel thickness directly in terms of frequency. Since the velocity of sound varies with different materials, the thickness of other materials may be measured by applying an appropriate multiplying factor to the scale. In addition to its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application to thickness measurement, the Audigage can be used for the detection of laminar flaws, and for the determination of the bonding between materials. The operations required to make thickness measurement can be performed by one person. The Audigage can be used not only for testing steel, but also for many other materials, such as brass, aluminum, copper, nickel, and glass. The instrument will, however, give no indication when applied to cast iron, concrete, or other porous materials.

In using the Audigage, the surface to which the crystal is to be applied must be smooth and a thin film of oil or grease applied to provide a coupling between the surface and the crystal. The supersonic sound wave can be transmitted through mill scale, plating, enamels, and even thin coats of hard paint. However, if the surface is extremely rough, or covered with a thick layer of paint or scale, it must be smoothed with a file or grinder. The crystal can be used on surfaces with temperatures up to 300° F.

*The instrument is manufactured by Branson Instruments, Inc., Danbury, Conn., under license from General Motors Corp.

Subsurface Sucker-Rod Pumps

(Continued from page 109)

fecting pump efficiency by the slight added pressure drop at the pump inlet when pumping highly volatile and gassy fluids, especially when it is necessary to pump the well down to a low fluid level to produce its allowable. Any influence on production can be determined by making alternate runs with single, and double, standing valves. In the case of traveling valves, the use of double valves of standard size cannot adversely affect production rates. The content of the pump barrel must be raised to the tubing pressure of several hundred, or several thousand, pounds per square inch before the traveling valve will open in any case and the extra pound or two required to overcome the resistance of an additional valve is of no significance.

Corrosion

In the matter of trouble from corrosion, aside from the selection of most suitable materials, it is suggested that consideration be given to the possibility of reducing corrosion by reducing maximum temperatures. The compression of gas within the pump barrel can result in very high temperatures, and a rise in temperature always greatly increases the speed of a chemical reaction. As a rough approximation the chemist Ostwald estimated that the speed of a chemical reaction was about doubled for each 10° C. (18° F.) rise in temperature.

In pumping a well with a pressure of 2,000 psig. at the pump, any gas collected in the pump barrel must be compressed to the value before any fluid can be delivered to the tubing. If oil and methane are being pumped from a well having a bottom-hole temperature of 150° F., with an intake pressure of 20 psia., the temperature of the methane can rise to a value above 1,300° F. as a result of adiabatic compression, with this compression ratio of over 100 to 1 in a single stage. Still higher temperatures can result from higher discharge pressures, lower intake pressures, higher bottom-hole temperatures, or any combination of these factors. For methane which is the major constituent of most natural gas, the ratio of specific heat at constant pressure to specific heat at constant volume:

$$\frac{C_p}{C_v} = k = 1.316$$

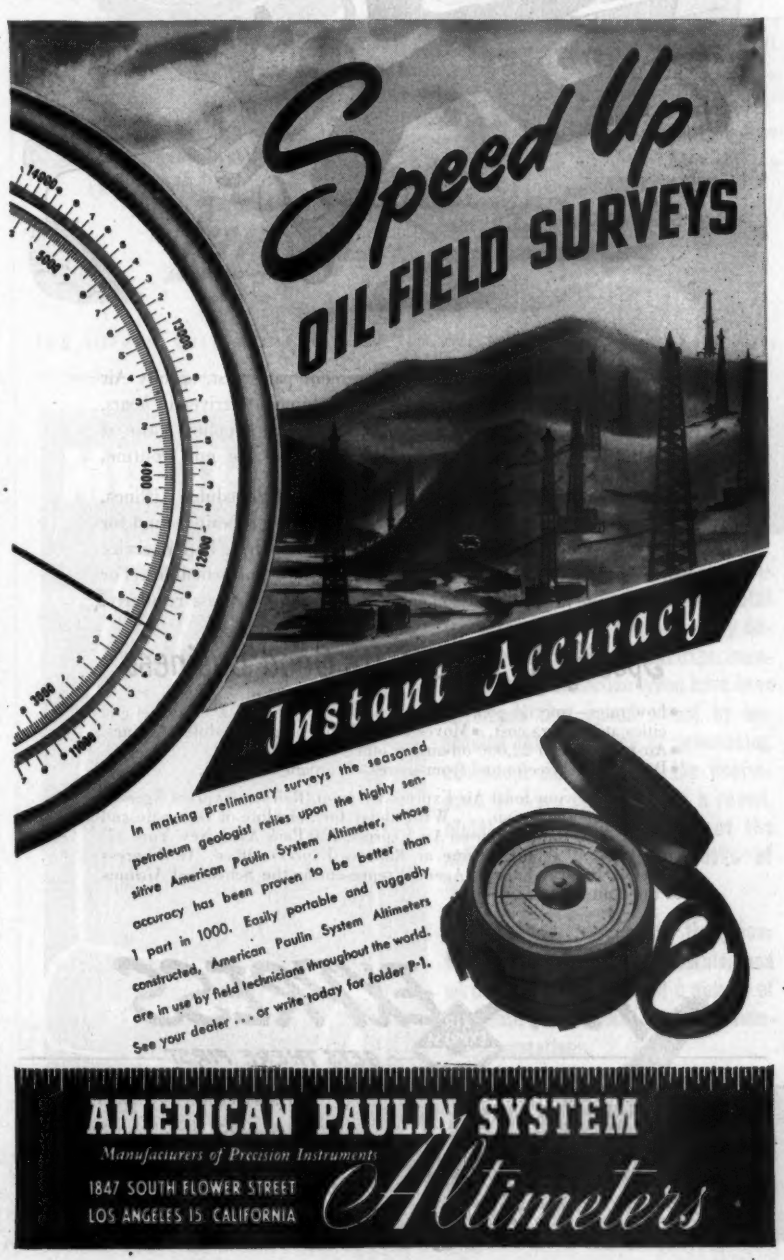
and

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{k-1/k} = \left(\frac{P_2}{P_1}\right)^{0.24}$$

where

T_1 = initial absolute temperature
T_2 = final absolute temperature
P_1 = initial absolute pressure
P_2 = final absolute pressure

From this relation, and knowledge of inlet pressures, discharge pressures,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and bottom-hole temperatures, the maximum temperature obtainable by adiabatic compression can be calculated. Actual temperatures probably are considerably lower because of the cooling action of a relatively small bore pump surrounded by oil. Any quantity of permanent gas possible to pick up on a single stroke will occupy a very small volume at such discharge pressures, and its heat capacity will be small. However, the high temperatures developed will give a condition similar to that resulting from cavitation in high-speed rotary devices such as pumps and turbines, which may cause direct damage to finished surfaces as a result of the high temperature, and corrosive action undoubtedly will be accelerated as a result of this effect.

The traveling-valve ball and seat probably is most seriously affected by the hot gas inasmuch as the gas will accumulate above the liquid in the pump barrel and will be forced through the traveling valve just as it reaches its maximum pressure and temperature. If a double traveling valve is used, the upper one will be protected from high temperatures by liquid trapped between the two valves, and this is another reason why a double traveling valve should give superior results. The standing valve should not be affected by the heated gas since it is submerged in oil.

The only apparent precautions to minimize the effects of hot gases are to utilize as slow a pumping speed as possible to obtain the required production and to allow as much time as possible for cooling during compression. The quantity of free gas in the pump can be minimized by maintaining large openings at the pump inlet by using oversize standing valves and gas anchors, and the heat capacity of the hot gas will be decreased in proportion to its volume.

Effect of Stretch of Sucker Rods and Tubing

Space will not permit a survey of the problems resulting from elasticity of sucker rod and tubing strings, and the practice of using tapered rod strings to effect savings in rod costs and to minimize rod stresses. Such a discussion would be a repetition of previously published information.[123]

Figs. 7 and 8 show curves which can be used, with correction factors in Tables 3 and 4, and the accompanying explanations, to determine plunger strokes and pump displacements corresponding to various polished-rod strokes, for all common rod and tubing combinations, and densities of well fluids, for seven commonly used pump bores. The notes show methods for determining plunger strokes with uniform rod strings and with tapered strings. It is pointed out that these curves do not take account of dynamic

effects, which vary with the pumping speed and may result in "overtravel" of the plunger at high speeds. The displacements given by the curves, therefore, can be considered as minimum values to be expected. The curves were computed on the assumption that some grade of steel rods would be used and a value of 29,000,000 for the modulus of elasticity was assumed. If nonferrous rods are used an appropriate correction must be made for modulus of the material.

Before closing it should be emphasized that the largest pump does not always produce the most oil, with all other factors identical. For example, if we consider the relative displacements of 1¾, 1½, and 1¼-in. bore pumps when operated at a depth of 4,000 ft. with a 36-in. polished-rod stroke, at 20 s.p.m., with ⅞-in. sucker rods and 2-in. tubing, producing oil of 30° A.P.I. gravity, it is seen from Figs. 7 and 8 that a 1¾-in. bore pump will have a net displacement of 84 bbl. per day, a 1½-in. bore pump has a displacement of 126 bbl. per day, and that of a 1¼-in. pump is 88 bbl. per day. If maximum displacement is wanted, the 1½-in. pump is the logical selection, but if a displacement of 80 to 90 bbl. per day is sufficient, the 1¼-in. pump is preferable to the 1½-in., or the 1¾-in. pump because of the lighter load on the equipment.

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1. E. A. Stephenson, "Stretch of Sucker Rods," The Oil and Gas Journal, October 5, 1946.
2. E. N. Kemler, "The Design of Tapered Sucker Rod Strings," The Oil Weekly, August 2, 1943. "How to Determine Proportions of Sucker Rod Strings," The Oil Weekly, August 7, 1944.
3. B. B. Wescott and C. N. Bowers, "Economical Selection of Sucker Rods," Trans. A.I.M.E., Vol. 114, 1935.

BOOKS

CONFERENCE GUIDE TO BASIC MANAGEMENT TRAINING. By Arthur S. Hotchkiss. Published by National Foremen's Institute, Inc., Deep River, Conn., 206 pp. $5.50.

This volume deals with the need to secure top-management approval of the supervisory training program projected by the conference leader for company use. How to convince the management group of the program's value is concisely outlined. The central theme of the basic management program is the idea that supervisors are part of management and, therefore, to function properly the supervisors need to be informed and stimulated regarding their responsibilities, and that they must actually practice their knowledge.

CONSTRUCTION SPECIFICATIONS OF THE ASPHALT INSTITUTE. Published by The Asphalt Institute, 801 Second Avenue, New York. 303 pp.

These institute specifications replace those contained in the previous edition, dated May 1, 1944. They are designed to provide broad general standards of acceptable methods and materials for assuring completely satisfactory construction results. They are not intended for specific jobs, but to serve as guides in developing more detailed specifications having narrower limits of tolerance than is desirable in general specifications.

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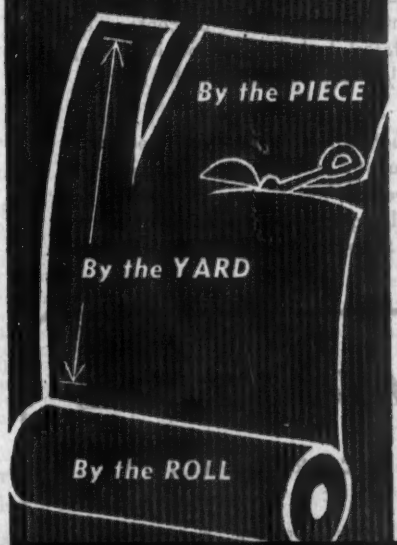

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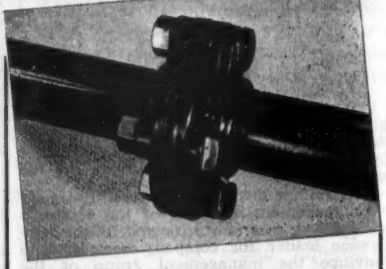

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DIGESTS

A.S.M.E., HOUSTON, OCTOBER 5-8

Internally Insulated Piping And Pressure Vessels for High Temperature Service

P. E. DARLING, Chief Refinery Engineer, Pan American Refining Corp., Texas City, Tex.

THE tremendous amount of petroleum process research in recent years has posed many varied mechanical-design problems. Economically satisfactory resolution of new major problems is essential to successful commercial application of a process. One important tool is internal insulation for lines and vessels required to operate at sufficiently high temperatures to render the use of bare metal either impractical or exorbitant in cost.

Actual application is complex because of the large number of variables such as cyclic temperature or pressure, corrosion and erosion, and limitations imposed by the characteristics, manufacture, fabrication, erection, or maintenance of both insulation and metal. Four examples are given.

The design of fixed-bed reactors and the recirculating catalyst regeneration system for the first commercial Hydroforming unit was very difficult. Economics dictated carbon steel with internal insulation for both the reactors and regeneration piping. The insulating block and brick reactor liner failed and was replaced with suspended refractory tile which is satisfactory. The regeneration piping was protected with a cartridge-type liner packed with insulation but maintenance was excessive. Improved liner material and pumped plastic insulation corrected the situation.

Hydroforming unit experience, though largely negative at the time, led to successful and economical suspended refractory tile lined regenerators in fluid catalyst units. Seventy-two-inch i.d. spent catalyst lines presented several problems. Lapped sectional carbon steel lines backed by insulating block were successful except at points of extreme turbulence. Longer sections with plastic insulation pumped into the annular space provided an economic solution.

Comparison of Prime Movers For Pumping Wells

J. H. FIELD, Sohio Petroleum Co., Oklahoma City.

WITH the cost of producing a barrel of oil increasing considerably during the past few years, operation of marginal properties necessitate reduction of operating expenses. To this end proper selection of prime movers is essential. Consideration is given to the advantages and disadvantages of gas engines over electric-motor operation of pumping units, and multiple-cylinder engines are compared with single-cylinder engines. The rating of gas engines by operators varies considerably, and it is necessary to understand the method of rating a gas engine to make proper application. Selection of gas engines and electric motors is discussed. An important factor in the selection of any prime mover is the expected operating expense. Comparative costs of operating electric motors and gas engines are reviewed. Statistics are also given on the cost of operation of electrical generating plants.

Some Factors Influencing Commingling in a Products Pipe Line

D. A. ROACH, Products Pipe Line Department, Phillips Petroleum Co.

NECESSITY of commingling control and the methods economically justified to secure this control vary widely in different pipe-line systems. Each system is a special problem due to differences in length, design, equipment, and type of product handled. The methods of commingling control described are used on the Phillips Petroleum Co.'s products pipe-line system which extends from Borger, Tex., to Chicago. Deliveries are made to 9 terminals while products are received for shipment at 5 locations and 13 different products are regularly transported.

Measures to minimize commingling or intermixing are observed on all product shipments. Three classes of products receive particular attention and are referred to as special products. This group consists of (1) kerosine, burning oils, and distillates, (2) butane, and (3) aviation gasolines. The first step in commingling control of a special product consists of proper sampling and testing before the product is accepted for shipment.

Tests indicate that the length of the intermixed or commingled portion between successive slugs tends to increase very little with continuing line travel. These tests also indicated that after the initial station, the length of the intermixed or commingled portion was proportional to the number of stations through which the products had been handled. The source of this increase in the volume of commingling during station handling is the "dead fluid" in station bypasses and equipment.

The majority of the 27 stations on this system were built prior to 1937 and importance of eliminating sources of dead fluid in their design was not given full consideration at that time. Instead of making piping and equipment changes, the leading portion of the slug of special product is used to displace or wash the dead fluid from station bypasses and equipment. This procedure eliminates the possibility of this dead fluid being slowly displaced and absorbed by a considerable length of the slug of special product.

The amount or quantity of commingling experienced in the operation of this system could probably be reduced by extensive system changes and additions. Procedures outlined have been found to be effective, simple, and economical in controlling and limiting commingling of successive products being transported in this system.

Service Life of Austenitic Alloy Furnace Tubes

CHARLES S. PUGSLEY, JR., Standard Oil Co. of New Jersey, Louisiana Division, Baton Rouge.

SELDOM are data on long-time service life of alloy materials available as the basis of selecting materials; hence service-life data on 18-8 chrome nickel steel tubes operating in thermal cracking service for 16 years prove interesting. Tubes involved in the study are 4½-in. o.d. by 0.400-in. wall in the radiant section of furnaces having a normal coil inlet of 900-1,000 psig., 1,500 psig. maximum, and a coil outlet of 900°-1,000° F. with a maximum tube-metal temperature of 1,200° F.

After 5 years of operation, a portion of the tubes at each turn-around were removed for sandblasting, inspection, and reconditioning. Gradually the number removed was increased until each tube was removed after 6 months' service. After finding cracks in some of the tubes, each tube was removed every 3 months. (Now tubes are removed every 4 months.) After most of the tubes had 60,000 service hours decision was made that they should be retired. This decision was based on the increased rate of bulging after 50,000 hours and the roughened appearance and surface cracks and defects after 60,000 hours. Careful and frequent inspections of the tubes and strict adherence to the 1,200° F. tube-metal temperature limit held the number of failures in service to two tubes in 16 years of operation.

Control of Commingling in Products Pipe Lines

EDWIN A. BIRGE, Plantation Pipe Line Co., Atlanta, Ga.

THE amount of commingling which will occur between different petroleum products in a products line is a question which must be answered before the feasibility of a new line can be established. When designing a products line a proper relationship between the amount of commingling which will occur and the volume of products pumped through the line must be established. This is necessary because the mixture between products must be disposed of at the end of the line; and the most economic means of disposing of it is to blend it into other products of similar nature. Some of the known factors which effect the commingling between products are discussed; and a means of estimating the amount of such commingling for any given line is included.

Effect of Leakage Around Cross Baffles in a Heat Exchanger

A. M. WHISTLER, Process Consultant, C. F. Braun & Co., Alhambra, Calif.

CROSS BAFFLES in heat exchangers must be made smaller in diameter than the inside diameter of the shell. This clearance is provided in order that (1) the exchanger can be assembled in the shop, and (2) the elements can be withdrawn and reinserted after use. Fluid leaks through these clearances causing loss of efficiency in two ways: first by loss of temperature difference; second, by less of heat-transfer rate due to lowered velocity across the tube nest. The two problems are analyzed mathematically. Charts are drawn to illustrate the formulas. The results, though based on mathematics, may have application in correlating data from tests on different sizes of exchangers.

Corrosion of Oil-Well Equipment

L. C. CASE, Gulf Oil Corp., Tulsa.

CORROSION of oil-well equipment has probably received less attention and is less well understood than many other corrosion problems. In general, it is due to water and where corrosion is severe the water has certain recognizable characteristics. It is shown also that water-oil ratio is significant, depending on nature of oil and water. Chemical attack on oil-well equipment is often accompanied by the corrosion-wear process and by galvanic current corrosion. Thus, solution to the problem requires the combined efforts of

both chemists and engineers. A few rather effective remedies for well equipment corrosion are now in use. Resistant materials are limited by cost. Likewise, coatings are usually uneconomical due to cost and short life. Chemical neutralization is not highly successful. Formaldehyde has indicated a rather high degree of effectiveness in certain sulfide areas and oil-wetting agents give promise of further development.

Some Properties of Low-Carbon 8½ Per Cent Nickel Steel

T. N. ARMSTRONG and G. R. BROPHY, The International Nickel Co.

THE well-known property of nickel in imparting toughness to ferritic steels at temperatures as low as —200° F. led to a study of the effect of nickel contents higher than heretofore used in commercial low-alloy steels. It was found that addition of 8 per cent or more nickel to a low-carbon steel results in lowering the transition temperature of ductile to brittle fractures to a temperature below that of liquid air.

Excellent strength properties at normal temperatures and relatively high impact properties at temperatures as low as —320° F. are developed by normalizing and reheating at 1,050° F.

Low-carbon 8½ per cent nickel steel can be made and processed by methods corresponding to those employed for standard types of low-carbon, low-alloy steels. The material can be hot rolled into any of the commercial shapes and can be cold rolled into strip. Large heads have been spun, and dished heads have been hot formed between dies. A considerable quantity of seamless tubing has been produced commercially, and small-diameter tubing has been welded from thin-gage strip.

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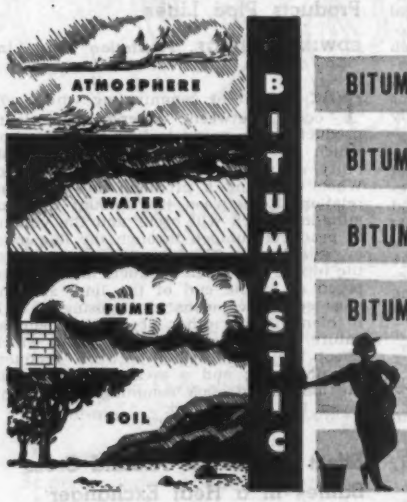

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Heavy Crude Oil and Fuel Oil Handling

E. L. ADAMS, Manager of Pipe Lines and Vice President, General Petroleum Corp.

THIS paper deals with the pumping of heavy crude oils below 18° A.P.I. gravity and fuel oils of from 100 to 230 seconds Furol viscosity at 122° through pipe lines of considerable length buried in soil. The pumping of such oils varies from the pumping of lighter oils only in the necessity of maintaining a high temperature in the oil throughout its travel through a pipe line to avoid excessive pressure losses due to friction.

An actual line in territory experiencing fairly severe winters is described in detail, with examples of operating conditions both in mild weather and under severe winter conditions.

Concrete examples are given of cases where actual conditions of flow seem to show the danger of depending too highly on the figures obtained from standard heat loss formulas. Some speculations are given to the consideration of the actual flow conditions failing to follow the formulas, and a method is suggested for more accurate determination of the heat-loss factor before designing a line.

Interfacial Mixing Characteristics Of Products in Product Pipe Lines

S. S. SMITH and R. K. SCHULZE, Shell Oil Co., Inc.

ADVANCEMENT of the pipe line to a foremost position in the field of transportation of finished petroleum products has paralleled the development of techniques for successfully handling many different products through a single line. This type of operation introduces the problem of the amount of mixing that will result from the movement of one product against another, and much speculation and study have been given to determining methods of evaluating this quantity. Based on a laboratory investigation, employing a small-scale pipe line, a series of studies was undertaken to determine the factors governing the rate of mixing under various conditions of flow and to develop formulary applicable to the design of commercial size lines. The results of this investigation and the conclusions reached, together with comparative data from actual operations, are contained in the report covering this experimental work.

Hydraulic Pumping of Oil Wells

W. F. SLATER, Kobe, Inc., Huntington Park, Calif.

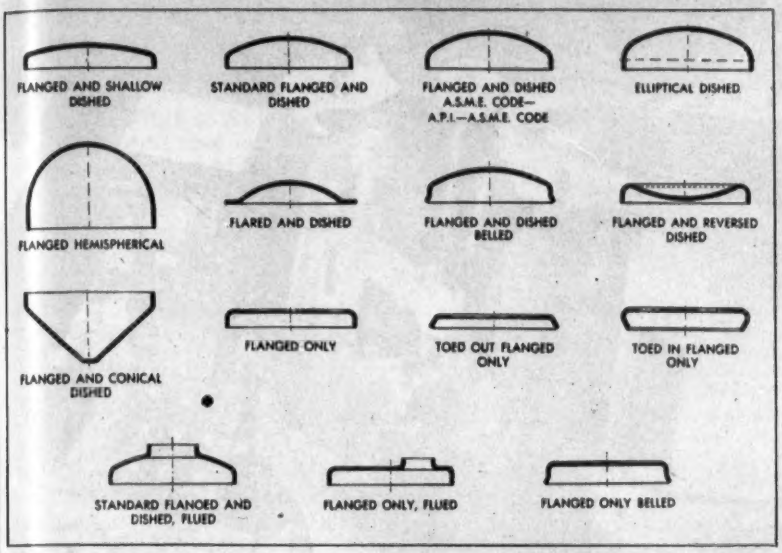
DISCUSSION is made of the progress in application and operation of the hydraulic oil-well pumping system during the past 10 years. The operating principle of the system is described as to the subsurface unit and the surface-equipment layout. Brief comment is made on the activity in design changes during that period and regarding the developments made in answer to operating problems which have arisen. The latest development, an extension of the method, called free-type pumping, is presented with a review of the system arrangement, operation and features. To estimate the effect of this development on operating economy, a comparison is made for the pulling of a 7,500-ft. well.

Round tripping a conventional pump: 4-man crew—8 hours equals 32 man hours. For surfacing a free pump: 1 man—50 minutes surfacing, 50 minutes seating, 20 minutes—other operations; 2 man hours. This comparison is reported to involve only manpower and does not include the savings on equipment, down time due to job delay, and other factors of such nature.

PROGRESS IN METALS

by W. L. Nelson

Consulting Engineer



Fifteen types of heads for welded vessels are shown in this figure. In the top row is shown the standard A.P.I.-A.S.M.E. Code flanged and dished heads. All of these types are spun or pressed by Lukens Steel Co., Coatesville, Pa. When clad steel is employed, the inside is usually clad, although the outside or both sides may be clad

Low-Temperature Vessels For Butyl Rubber

REAL proof of the usefulness of low-alloy nickel steels for low-temperature services is the recent purchase of nearly 500 tons of 3½ per cent nickel steel for the fabrication of drums, vessels, etc. The equipment was designed by Standard Oil Development Co. for use in the production of butyl rubber. A minimum Charpy impact strength of 15. ft. lb. at minus 150° F. was specified. The steel, A.S.T.M. A203 Grade A, was supplied by Lukens Steel Co., Coatesville, Pa., and was fabricated into drums by Steel & Alloy Tank Co., Newark, N. J.

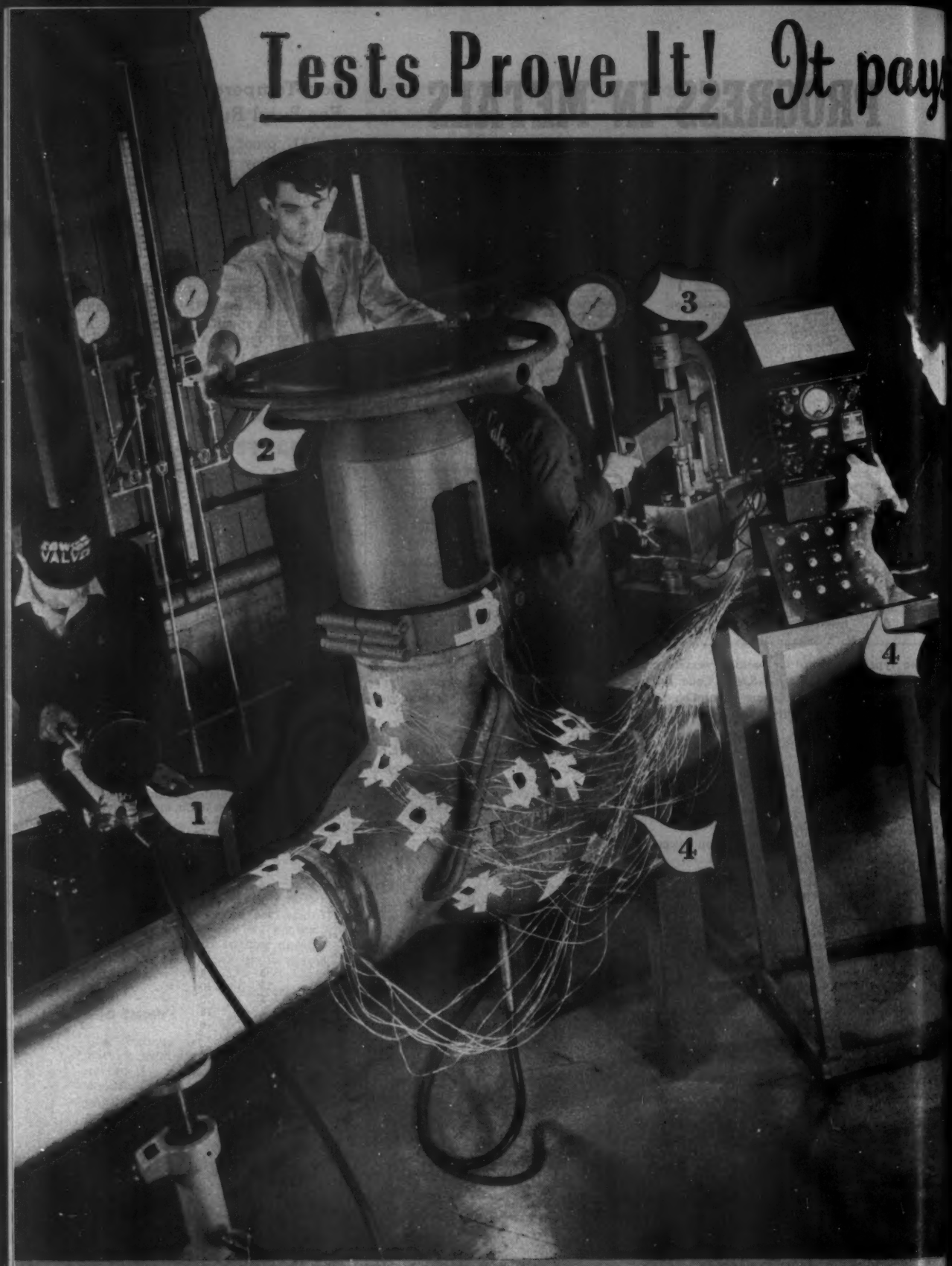
Plant Corrosion Tests of Copper Alloys

THE tabulation on this page, which was taken from " A Study of the Corrosion of Copper Alloy Condenser Tubes," by N. W. Mitchell (A.S.M.E., Tulsa meeting, October 1946) shows the results of plant experiments on the corrosion of copper-base alloys used in refinery services. Attack by sulfur and by water are the main types of corrosion. The most resistant alloys are shown in the table in boldface type.

CORROSION OF COPPER ALLOY CONDENSER TUBES

	Per cent of original tensile strength lost, due to corrosion							
	Antimonial admiralty, 72 Cu, 1 Sn, 0.05 Sb, 26.95 Zn	Admiralty, 71 Cu, 1 Sn, 28 Zn	Red brass 85 Cu, 15 Zn	20% cupro nickel 80 Cu, 20 Ni	30% cupro nickel 70 Cu, 30 Ni	Aluminum brass 76 Cu, 2 Al, 22 Zn	Muntz metal, 60 Cu, 40 Zn	Copper
1. Attack predominantly by sulfur:								
4 mos. in vapor line, top of vacuum tower	2	2	63	66	...	...	...	...
4 mos. in vapor to oil exchanger	19	17	27	29	...		...	...
4 mos. in gasoline vapor line	7	8	23	27	...	20	...	...
3 mos. in vapor stream, top of bubble tower	62	77	88	52	...	100	79	...
5 mos. in vapor side, crude still partial condenser	9	6	7	7	...	7	...	...
5 mos. in oil vapor stream leading to condenser	38	31	79	33	...	43	...	...
1 mo. in bubble tower vapors, 386° F.	4	4	16	...	...	...	...	...
4 mos. in stabilizer reboiler vapors, 386° F.	4	4	60	...	...	...	...	...
4 mos. in stabilizer overhead vapors, 180° F.	5	5	5	...	...	...	...	...
3 mos. in gasoline vapor line to condenser	8	6	10	8	...	...	...	...
8 mos. in vapor side, unit condensing gasoline	3	4	5	...	8	4	...	...
11 mos. in unit condensing heavy gasoline vapors	9	10	14	...	15	10	...	...
19 mos. in vapor side, flash tower overhead condenser	4	3	3	...	2	3	...	...
6 mos. in condenser shell, water and gasoline condensed	13	14	23	10	...	13	...	...
6 mos. submerged in water-gasoline condensate	8	8	10	4	...	6	...	...
5 mos. in caustic side of stream to caustic exchanger	39	...	100	15	...	...	...	...
3 mos. in treated gasoline vapors, 300° F.	48	55	44	27	...	63	...	...
9 mos. in experimental condenser, gasoline vapor	16	12	22	7	...	10	...	...
8 mos. in reflux condenser	6	11	10	10	11	...	...	...
5 mos. in vapor line to condenser	15	25	39	13	...	44	44	...
3 mos. in high stage condenser—bottom center	17	22	49	...	23	...	...	...
3 mos. in high stage condenser—top center	20	17	22	...	30	...	...	...
High-pressure fractionating column, Dubbs unit:								
1.4 per cent sulfur, 121 days at 698° F.	...	...	100	...	...	...	53	...
1.4 per cent sulfur, 115 days at 680° F.	16	13	100	...	...	...	12	...
1.4 per cent sulfur, 26 days at 599° F.	6	7	100	...	100	7	7	...
1.4 per cent sulfur, 27 days at 545° F.	4	2	100	...	100	16	1	...
1.4 per cent sulfur, 27 days at 491° F.	2	2	100	...	57	10	1	...
2. Attack predominantly by water:								
38 days, vapors from alum evaporator	47	96	44	44	...	...	...	...
15 mos., corrosive water	2	0	1	0	...	3	...	...
5 mos., cooling water to condenser	8	5	5	4	...	4	...	...
4 mos., condenser-box water, 125° F.	2	1	0	...	...	...	...	...
3 mos. in cooling water to condenser	5	3	2	3	...	...	...	...
5 mos. in condenser-box water	4	12	3	0	...	2	34	...
12 mos., water side, flash tower overhead condenser	38	50	51	...	39	53	...	...
Special case, benzol, chlorinated hydrocarbon, and steam at 160° F.	36	45	48	14	...	...	...	48
Special case, specimens immersed in carbon black paste 20 days	2	...	2	...	2	...	...	8

Tests Prove It! It pays



Stress analysis of new valve design in which the three major stresses encountered in service are duplicated and measured.

1. Application of bending load simulating pipe line stresses.
2. Application of load resulting from seating valve with Edward Impactor handwheel.
3. Application of internal line pressure to valve.
4. Measurement of resulting strains with SR-4 strain gage equipment. Measures in millionths of an inch.

Flow testing facilities in background.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Sizing of Refinery Oil Lines

CONSIDERATIONS in the sizing of oil lines involve (1) friction loss, (2) cost of pumping, and (3) costs related to large-diameter lines such as heat losses, heavier walls, and insulation. The sizing of water and steam lines will be considered in Refiner's Notebook 171 (November 22, 1947).

In suction lines to pumps the allowable friction loss is fixed by the suction characteristics of the pump. Refiner's Notebook No. 155, entitled, "Suction Lift of Pumps" (August 2, 1947) and No. 159 (August 30, 1947), entitled, "Vacuum and Close-Clearance Pumps" show that suction line losses must not exceed 15-22 ft. of suction head (4.5-6.5 psi.) even under ideal conditions in which the liquid exerts no significant vapor pressure. Of course, suction head can be provided by setting the pump well below the level in the suction tank.

Likewise, certain process lines such as vapor lines, gravity-flow rundown lines, etc., which operate under conditions of a fixed and limited head, require the consideration of friction loss. These must be recognized by the designer, who then makes pertinent computations rather than to rely upon general rules.

Friction loss is also of primary importance in connection with long lines such as pipe lines for crude oil or finished products. In such lines the cost of pumping is carefully balanced against the cost of installation. Somewhat the same situation is encountered in large-volume services such as the circulation of water over cooling towers in a refinery.

Other than these considerations, friction loss, although always involved in piping design, is of secondary importance.

Cost of pumping and of installation.—Pumping costs can be estimated from the chart of Refiner's Notebook No. 145 (June 7, 1947, page 103) but installation costs must be computed in detail by means of price quotations on each of the sizes of line contemplated. However, Table 1 is a most general indication of the economic sizes of such lines (see Questions on Technology, The Oil and Gas Journal, November 3, 1945, page 115, and September 21, 1946, page 298).

Capacity Ranges

Although the ranges of economical capacity shown in Table 1 appears to be large, it should be recalled that only certain pipe sizes are available (even in line pipe), and hence the capacity may need to be altered if most economical operation is to be attained. In general, most economical operation occurs at capacities near the center of the capacity ranges shown in Table 1.

Large diameter.—The cost of installation increases rapidly with pipe size, particularly if the system involves many valves and fittings. Heat losses are also greater with large-diameter pipe, or conversely they must be insulated more heavily. Finally, the strength of a large tube or pipe is not as great as that of a small one and hence a thicker-wall heavier-grade pipe must be used, particularly if the internal pressure is high. All of these factors tend to encourage the use of smaller pipe or higher velocities when the amount of material being handled is very large.

Applications

So many possibilities exist with respect to oil that general rules tend to be misleading. Nevertheless, the capacities of oil lines are somewhat as shown in Table 2 which is based on 1-4 ft. of head loss per 100 ft. of pipe (0.025-0.12 psi. per 100 ft.). These same ranges are shown on the velocity-pipe size chart of Refiner's Notebook No. 163 (September 27). Of course, Table 2 must never be used for pump suction lines, gravity-rundown lines, or any special situations in which pressure drop is limited by process considerations.

Customary velocities through the radiant section of pipe stills are listed in Refiner's Notebook No. 111 (September 21, 1946, page 305).

In determining the sizes of vapor lines of fractionating towers it is customary to use velocities of 50-100 ft. per second, the lower velocities for heavy or high-pressure vapors, and the higher range for gasoline at atmospheric pressure.

TABLE 1—APPROXIMATE ECONOMIC CAPACITIES (BARRELS PER HOUR) OF CRUDE-OIL PRODUCT, AND WATER-CIRCULATION PIPE LINES WHEN OPERATING AT ROOM TEMPERATURE

Std. pipe diameter	Crude oil		Products		Water
	Lightest	Heaviest	77 A.P.I.	35 A.P.I.	at 100° F.
2-in.	26- 50	22- 40	.....	.....	.....
3-in.	50- 90	40- 75	53-120	40- 90	45-100
4-in.	90-180	75-140	120-240	90-170	100-200
6-in.	180-500	140-400	240-700	170-500	200-600

TABLE 2—APPROXIMATE PIPE SIZES FOR OIL LINES

Viscosity at flowing temperature		Gallons per minute				
U.S.S.	Centistokes	1½-in.	2-in.	2½-in.	3-in.	4-in.
30	2	10-30	20-50	40-80	60-140	140-260
50	8	....	15-40	30-60	50-120	100-240
100	20	....	5-35	20-55	40-100	80-200
300	65	....	25	15-40	35- 80	70-180
500	108	....	....	10-30	30- 70	60-160
1,000	216	....	....	....	40	40-120
1,500	324	....	....	....	....	80

No. 166 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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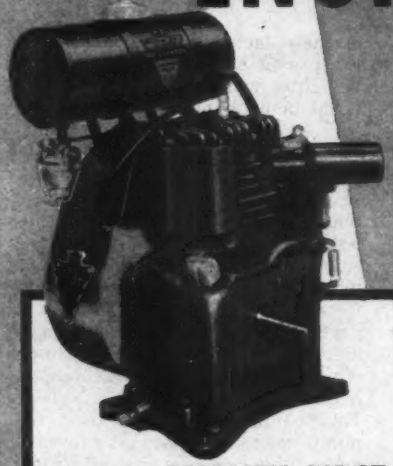

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MODERN Rotary DRILLING

Compounding of Engines and Transmission Equipment

Four-engine compounding.—One of the arrangements for four-engine compounding is shown schematically in Fig. 40. This is a highly flexible arrangement, permitting simultaneous performance of different functions of the rig such as operation of two pumps while drilling, one for actual circulation of mud and the other for mixing of mud or other purposes.

Any desired number of engines may be compounded for hoisting. While drilling, engine No. 1 drives the rotary. The main drilling pump, pump No. 1, may be driven from engine No. 4, while engine No. 2 may drive pump No. 2. It is apparent from Fig. 40 that a number of different combinations of engines may be coupled together for any given operation. For instance, engines No. 2 and 3 may be compounded to drive pump No. 2, engines No. 3 and 4 may be compounded to drive pump No. 1, etc.

Compounding transmissions.—Compounding equipment is usually arranged in the form of self-contained compounding units. This is in line with the modern trend of rig design, which arranges the components of rig equipment in individual "packages," to facilitate dismantling and moving. V-belt or chain-drive compounding transmissions are used.

One type of a chain transmission is shown schematically in Fig. 41. This type of transmission is placed in a box-like, steel-plate housing, which is oiltight and dustproof. Oil to chains and sprockets is forced under pressure. The master clutch which transmits power to the selective-speed draw-works transmission, the V-belt pulley clutches, and the engine clutches are pneumatically controlled. Compounding is through clutches operated manually. Shafts and oil pumps may be removed easily from the housing.

A new compounding transmission, possessing a number of novel features so far as portability and flexibility are concerned, is now in process of being released to the trade. This compounding unit, designed for six-engine arrangement, is capable of transmitting up to 1,500 hp.

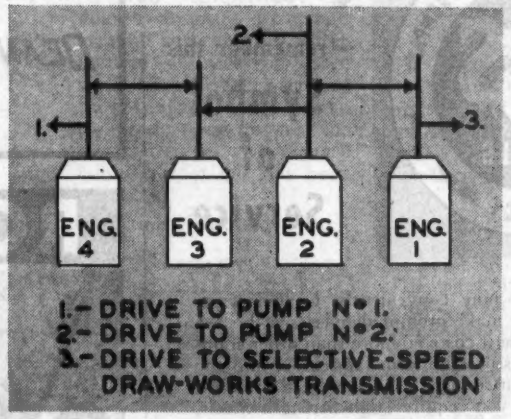

Fig. 40—(Right) Schematic sketch of a four-engine compounding arrangement

Diesel-electric compounding.—Distribution of power in a diesel-electric rig is by cables, and compounding is accomplished electrically. By compounding the generators in parallel, the maximum torque of the motor is increased nearly proportionally to the number of compounded generators (Installment 25). Series compounding increases the speed of the motor, without having effect on the maximum torque. Because of limits on maximum generator voltage there is a limit to the number of generators which may be compounded in series.

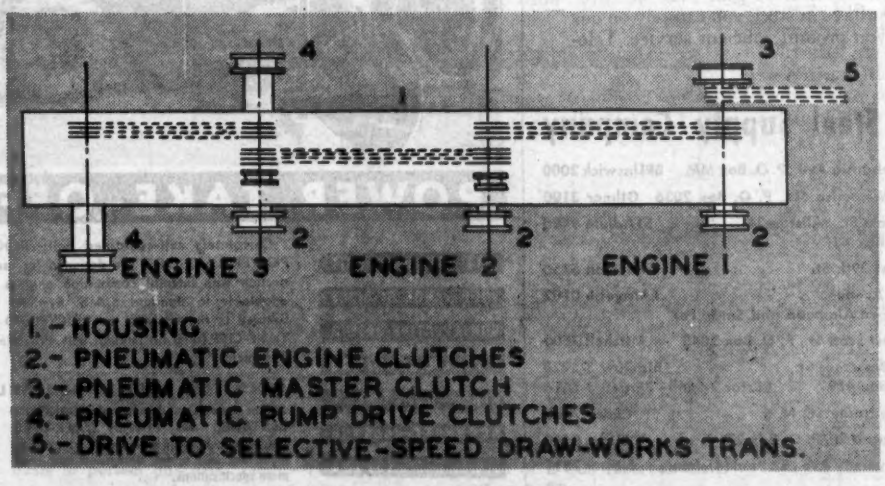

Fig. 41—Schematic sketch of a chain-transmission compounding unit

No. 41 in a series by Joseph Zaba, petroleum engineer, Houston

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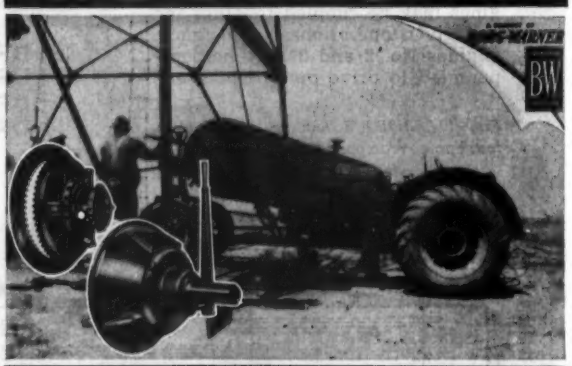

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ENGINEERING fundamentals

Application of Gas Behavior To Reserve Estimates

ONE of the most important applications of the gas laws is to the calculation of natural-gas reserves. The following will outline some of the details, assuming (1) that the reservoir contains no gas in solution in liquid, (2) that the reservoir pore space is constant in volume, and (3) that the reservoir remains at a constant temperature.

Consider that there is originally in the reservoir the equivalent of V_i standard cubic feet of gas (60° F. and 1 atm.), and that at any time there have been produced a total of V_g standard cubic feet of gas. Let V_r be the equivalent number of standard cubic feet remaining in the reservoir. The following must then be true:

$$V_r = V_i - V_g \qquad (1)$$

The standard volumes V_i and V_r can be represented in terms of the temperature and pressure under which they exist by means of the perfect gas law. This is, in general:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \qquad (2)$$

Specifically then, since V_r and V_i are defined at 60° F. and 14.7 psia., the following hold:

$$V_i = \frac{P_oV_p\,520}{T_f\,14.7} \qquad (3)$$

$$V_r = \frac{PV_p\,520}{T_f\,14.7} \qquad (4)$$

where

T_f = reservoir temperature in degrees absolute, a constant
P_o = original reservoir pressure
V_p = volume of reservoir pore space in cubic feet occupied by gas, also a constant, and
P = reservoir pressure at the time when V_g standard cubic feet of gas has been produced

Substituting these into Equation 1 gives:

$$P = P_o - \frac{14.7\,T_f}{520\,V_p}V_g \qquad (5)$$

This equation states that the total standard cubic feet of gas produced will plot linearly against the pressure on the reservoir and that the slope of the line will be $\frac{14.7\,T_f}{520\,V_p}$.

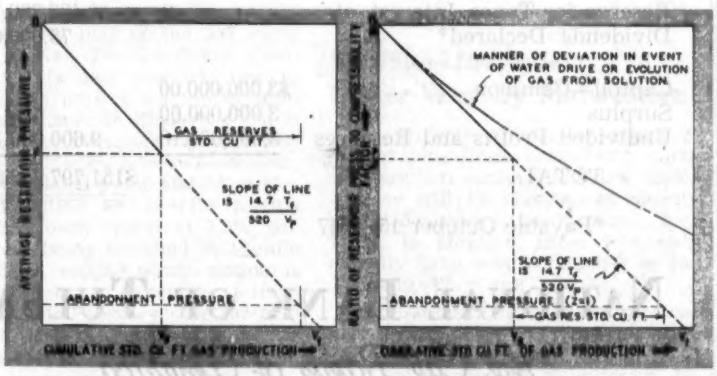
AVERAGE RESERVOIR PRESSURE
GAS RESERVES STD. CU FT.
SLOPE OF LINE IS 14.7 T_f / 520 V_p
ABANDONMENT PRESSURE
CUMULATIVE STD. CU FT. GAS PRODUCTION
RATIO OF RESERVOIR PRESS. TO GAS COMPRESSIBILITY
MANNER OF DEVIATION IN EVENT OF WATER DRIVE OR EVOLUTION OF GAS FROM SOLUTION
SLOPE OF LINE IS 14.7 T_f / 520 V_p
ABANDONMENT PRESSURE (Z=1)
GAS RES. STD. CU FT.
CUMULATIVE STD. CU FT. OF GAS PRODUCTION

Fig. 1—(Left) Pressure decline of a gas reservoir as a function of withdrawal, on basis of perfect gas law. Fig. 2—(Right) Pressure decline of a gas reservoir as a function of withdrawal, on basis of PV = ZnRT

An ideal representation of this equation is shown in Fig. 1.

Of course, it has been shown that natural gases deviate from the perfect gas law, and the above representation does not hold when such deviations occur. By using the compressibility factor, a similar representation for actual gases can be developed. With the compressibility factor, Equation 2 becomes:

$$\frac{P_1V_1}{Z_1T_1} = \frac{P_2V_2}{Z_2T_2} \qquad (6)$$

and Equations 3 and 4 for V_i and V_r become:

$$V_i = \frac{P_o}{Z_o}\,\frac{V_p}{T_f}\,\frac{520}{14.7} \qquad (7)$$

$$V_r = \frac{P}{Z}\,\frac{V_p}{T_f}\,\frac{520}{14.7} \qquad (8)$$

where Z_o represents the compressibility factor at P_o and Z the compressibility factor at P. The final equation, reached by substituting Equations 7 and 8 into Equation 1 is:

$$\frac{P}{Z} = \frac{P_o}{Z_o} - \frac{14.7\,T_f}{520\,V_p}V_g \qquad (9)$$

which states that the total standard cubic feet of gas produced should plot linearly against P/Z at any time. Fig. 2 shows an ideal representation of this relationship. The slope of this line is again $\frac{14.7\,T_f}{520\,V_p}$, the same as that in Fig. 1.

In using either of these relationships, observed pressures and cumulative gas production can be used to estimate formation volume, V_p, if it cannot be accurately calculated otherwise. Reserves are, of course, the standard cubic feet represented on the horizontal axis between the present pressure and abandonment pressure.

In the event that the basic assumptions do not hold, deviation from these ideal relationships will occur. Either the intrusion of water into the gas reservoir or the evolution of gas from liquid solution within the reservoir would tend to maintain pressure and give the type curve illustrated by the dotted line of Fig. 2.

New nomenclature:

V_p = available reservoir pore space, cubic feet
V_i = total standard cubic feet of gas in reservoir originally
V_g = total standard cubic feet of gas produced
V_r = total standard cubic feet of gas remaining in reservoir
P_o = original reservoir pressure, psia.
Z_o = original value of compressibility
T_f = reservoir temperature, degrees Rankine

Series prepared by Dr. John C. Calhoun, Jr., Petroleum Engineering School, University of Oklahoma

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STATEMENT OF CONDITION

October 6, 1947

RESOURCES

Cash and Due from Banks	$40,097,817.38	
U. S. Government Securities	79,388,424.74	
Other Bonds and Warrants	3,565,922.25	$123,052,164.37
Loans and Discounts		26,047,687.41
Overdrafts		5,433.13
Income Receivable Accrued		368,744.66
Prepaid Expenses		61,511.11
Stock in Federal Reserve Bank		180,000.00
Bank Premises		2,065,833.32
Customers' Liability under Acceptances		15,884.00
TOTAL		$151,797,258.00

LIABILITIES

Deposits		$141,532,640.86
Acceptances Executed		15,884.00
Income Collected, not Earned		86,896.78
Reserve for Taxes, Interest, etc.		486,776.18
Dividends Declared*		75,000.00
Capital—Common	$3,000,000.00	
Surplus	3,000,000.00	
Undivided Profits and Reserves	3,600,060.18	9,600,060.18
TOTAL		$151,797,258.00

*Payable October 15, 1947

NATIONAL BANK OF TULSA

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PIPE LINES

Midland-Wichita Falls 22-In. Contract Let

Contract for the construction of 253 miles of 22-in. pipe line from Midland to Wichita Falls, Tex., has been awarded Latex Construction Co., Houston, R. B. McLaughlin, president of The Texas Pipe Line Co., announced last week. Actual construction work will begin the latter part of this month.

This contract covers a section of the Jal, N. M.-Cushing, Okla., 20, 22, 24-in. pipe-line project, which will be owned on an undivided-interest basis by The Texas Pipe Line, Shell Pipe Line Corp., Empire Pipeline Co., and Sinclair Refining Co.

The Texas Pipe Line Co. has established construction headquarters for this project at Sweetwater, Tex., with A. N. Horne in charge as project manager, W. E. McCarthy, assistant project manager, and C. L. Parker, office manager. The field work will be directed from the construction office at Sweetwater.

It is anticipated that contract for the Jal-Midland section of the Jal-Cushing project will be let in January 1948. Contract for the Hearne-San Marcus, Tex., extension of the Texas Pipe Line Co.'s products system may be let in November. The West Columbia-Houston 16-in. crude-oil project of the company appears to be deferred until late in 1948.

Phillips McKee-La Junta Section Half Completed

Phillips Petroleum Co. has laid approximately half of the 307 miles for the McKee, Tex.-La Junta, Colo., section of its new products line to Denver. The project was undertaken in conjunction with Shamrock Oil & Gas Co.; the remainder of the line is to be completed late in November.

The completed pump station at McKee has filled an 80-mile section which has been tested at 1,500 psi. Valves are being installed at 15-mile intervals. A second pump station is to be completed in December; a third in January or February. The 152-mile La Junta-Denver section is to be finished in 1948 if pipe can be procured.

Line Nears Completion

To complete Humble Pipe Line Co.'s 40-mile, 20-in. Satsuma - Baytown, Tex., crude-oil line, 8 miles remained to be laid by the contractor, Latex Construction Co., early this week.

Tennessee Company Plans 106-Mile Trunk Gas Line

WASHINGTON.—The Federal Power Commission has received an application from Mid-East Tennessee Natural Gas Co. for authorization to construct a 106-mile trunk transmission line from Southern Natural Gas Co.'s proposed facilities near Chattanooga to Knoxville, Tenn.

The company said the project is designed to provide adequate gas service for industrial and commercial centers of the upper Tennessee River basin. Industries in the area include those being operated by the Tennessee Valley Authority, the Atomic Energy Commission at Oak Ridge and by the Aluminum Co. of America at Alcoa.

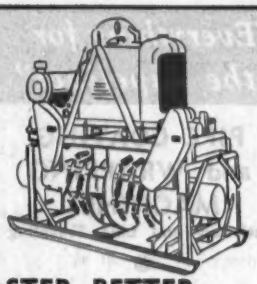
The line would pass through Cleveland, Athens, Sweetwater, and Maryville. Its size would depend upon the gas pressure at the intake, the company indicated, and in the event that 200 lb. is available, it is probable that a 10¾-in. line would be preferred. Initial delivery capacity of the line would approximate 25,000,000 cu. ft. daily with the use of a single compressor station. Installation of a second compressor station would increase capacity to 30,000,000 cu. ft. daily.

Mid-East Tennessee Natural Gas has its principal office in Chattanooga, Tenn.

Six Pipe-Line Jobs Under Way by Midwestern

Six projects calling for construction of pipe lines, compressor units, and terminal stations, are now under way or will be commenced shortly by Midwestern Constructors, Inc., Tulsa. In addition, three jobs only recently have been completed by the company. They are:

Installation of field gathering lines near Lakin, Kans., of approximately 140 miles for Colorado Interstate Gas Co.; construction of 47 miles of 16-in. gas pipe line for Ohio Fuel Gas Co. in Licking and Fairfield counties, Ohio; installation of a 77,000-ft. line for Ohio Fuel in Crawford County, Ohio (the old line is now in the process of being taken up, and this



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work is expected to be completed soon).

A 236-mile, 26-in. line for El Paso Natural Gas Co. from Tuscon, Ariz., to Blythe, Calif., is now under construction and is expected to be completed by October 20.

Installation of a 27,000-ft., 10¾-in. line, including 1,000 ft. of Ohio River crossing near Steubenville, Ohio, is expected to be completed by November 5 for J. R. Savage (Wierton Steel Mills) Wierton, Ohio.

Construction of 51.5 miles of 24-in. pipe line between Joliet and Chicago for Natural Gas Pipe Line Co. of America is to be completed by November 1.

Installation of 2½ miles of 20-in. line from an Ohio River crossing near Steubenville, Ohio, to Ohio Fuel Gas Co.'s West Virginia station is to be completed by November 10.

Installation of nine compressor units at Stinnett, Tex., for Texoma Natural Gas Co. is expected to be completed by October 1948.

Construction of two pipe-line terminal stations, one at Denver and one at Cheyenne, is to be finished by December 1947 for Wyco Pipe Line Co.

Panhandle's New Satanta Station Nears Completion

Panhandle Eastern Pipe Line Co.'s newest compressor station 3 miles west of Satanta, Kans., is scheduled to be completed this month.

The new station is located adjacent to the 18-in. field gathering line from Grant County field to the company's Liberal station. Chief engineer is A. L. Ormiston, former assistant chief engineer at Haven, Kans.

The new station consists of three RA-8 Clark angle-type compressor units totaling 2,400 hp. It is designed to compress 50,000,000 cu. ft. per day at a discharge pressure of 550 psi. through the present Grant County suction line to Liberal station. This gas can be bypassed around the Liberal station compressor unit directly to the gasoline plant and into the discharge line.

A glycol dehydration plant, similar to Panhandle's existing plant at Hugoton, is being constructed on the suction side of the station. Camp facilities for operating personnel consisting of one five-room and four four-room houses are under construction.

L. J. McArnarney, W. L. Miller, W. B. Haney, and J. H. Budden are engineers for the Satanta station.

Another new Panhandle Eastern project, a 250-watt radio station, recently went in operation at Liberal. Equipment includes a 250-ft. tower. The station itself is based in the production and gathering department offices in Liberal. It enables gas dispatchers to communicate with cars, the field, and gas wells.

Waverly Acquires Stock Interest in Pipe Line

S. M. Vockel, president of the Waverly Oil Works Co., announced October 14 that Waverly Oil Works Co., Pittsburgh, has acquired slightly over 8,000 shares of the common stock of the South West Pennsylvania Pipe Lines.

Waverly is the only refinery of Pennsylvania Grade crude oil that depends solely on the South West Pennsylvania Pipe Lines for delivery to its plant. "For its protection in having crude to process, during the past 10 years the Waverly Oil Works Co. and various associates have acquired extensive holdings of oil and gas leases throughout southwestern Pennsylvania, West Virginia, and the southeastern section of Ohio," Vockel said.

South West Pennsylvania Pipe Lines, a former Standard Oil Co. of New Jersey subsidiary, is one of the companies of the Southern group of pipe lines. Others are Eureka Pipe Line Co. and Southern Pipe Line Co. South West Pennsylvania Pipe Lines, 35,000 shares of common stock outstanding, operates solely in southwest Pennsylvania with both gathering and trunk lines.

Southern Pipe Line Co. operates a trunk-line system from the Pennsylvania state line near Morgantown, W. Va., to Millway Station east of Lancaster, Pa. Eureka Pipe Line Co. operates both gathering and trunk lines solely in West Virginia. Previously Elk Refining Co. and Quaker State Oil Refining Corp. acquired stock interest in Eureka Pipe Line Co.

Sinclair to Let Contract For Houston-Dallas 10-In.

Sinclair Refining Co. is preparing to contract this week for the laying of a 260-mile, 10-in. products line from Houston via Bryan to a point between Dallas and Fort Worth in the vicinity of Irvington.

Pipe is arriving and work will start immediately after the letting of contracts. Work will be done with three spreads.

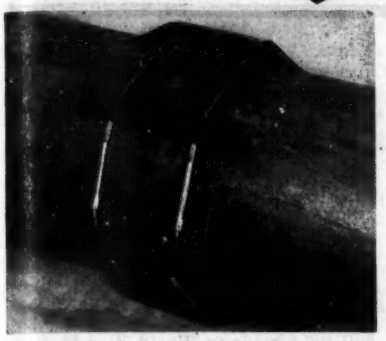
Construction of the Corpus Christi-Bryan products system has been completed, and the line is being tested. Deliveries will commence on the completion of tankage scheduled for November 15.

Canadian Line Completed

LLOYDMINSTER, Sask. — Lloydminster Gas Co. has completed at a cost of $50,000 a new 6-in. pipe line linking the field with this city. The company, which at present draws its supply from five wells, is negotiating a new rate agreement.

WRITE FOR LATEST INFORMATION

The New *Williamson*
PIPE LINE CASING
INSULATOR*



Williamson Pipe Line Casing Insulators are clamped around coated pipe 20 to 30 ft. apart before installing in right-of-way casing. Insulating blocks—hard and rugged—serve as skids, protecting pipe coating and insulating pipe from casing. Essential for cathodic protection.

*Patent Pending *Refer to Dept. J*

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Tomoconnor Flare Gas Now Moving to Pipe Line

APPROXIMATELY 35,000,000 cu. ft. of casing-head gas daily, formerly flared in Tomoconnor field near Refugio, Tex., began flowing to market October 7 when Humble Oil & Refining Co. started operating the compressor section of the $3,000,000 natural-gasoline plant being built jointly by Humble and Quintana Gas Co. in that field.

Every one of the field's flares have been extinguished. The casing-head gas produced with oil from 536 wells in the field is drawn into the plant at low pressure and is being compressed for delivery to Tennessee Gas Transmission Co.'s main line some 7 miles away.

Construction of the absorption-distillation facilities at the plant is scheduled for completion some time in December, it was announced by the joint owners. When finished, the plant will strip about 60,000 gal. daily of natural gasoline, L.P.G., and commercial propane from the wet gas. Only dry gas will then be delivered to the Tennessee system.

Delivery of the wet gas to T.G.T. lines months before completion of the entire plant, was undertaken, Humble and Quintana officials said, in the interest of gas conservation. This was made possible by the early completion of the compressor section of the plant and the laying of by-pass lines to route the flow of field gas around the absorption-distillation facilities still under construction.

Magnolia Pipe Line Awards River-Crossing Contracts

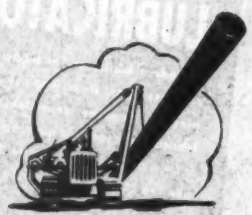
Contracts for Magnolia Pipe Line Co.'s crossings of the Mississippi River at Chester, Ill., the Arkansas River at Little Rock, Ark., and the White River at Batesville, Ark., have been awarded to Omaha Dredge & Dock Co., Omaha, Neb., for $403,000.

This work is a part of the $32,000,000 pipe line being built between Corsicana, Tex., and Patoka, Ill., and involving about 700 miles of 20-in. welded-joint pipe.

Tropical Oil Completes New Colombian Line

Tropical Oil Co. has completed its 125-mile 6-in. pipe line in Colombia, from Barrancabermeja to the Magdalena River port of Berrio, it has been reported. The line will supply petroleum products industries in the state of Antioquia and other regions inaccessible by river traffic when the water is low.

In the pipe line construction business, Oklahoma Contracting Co., Inc., gets the oil industry's OK of approval. For almost 30 years "OK" jobs all over the world have given us an enviable reputation. On that next pipe line job of yours get an "OK."



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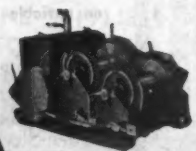

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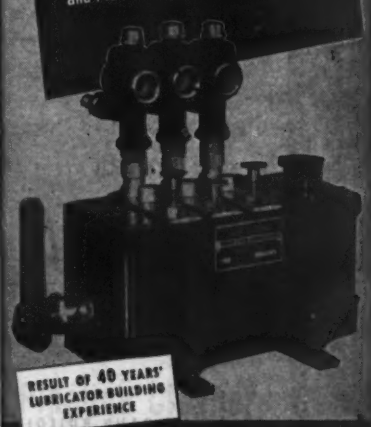

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REFINING

Alamo Refining Files Fluid Patent Suit

ALAMO REFINING CO., a Phillips Petroleum Co. subsidiary, has filed suit in federal District Court in Wilmington, Del., asking for a declaratory judgment of noninfringement of Fluid catalytic-cracking patents in connection with the operation of the Sweeney, Tex., refinery which Alamo bought last June from the U. S. Government.

Defendants in the action are Shell Development Co., Standard Oil Development Co., Texaco Development Corp., M. W. Kellogg Co., International Catalytic Oil Processes Corp., and Universal Oil Products Co. and M. W. Kellogg Co. as agents of Standard Oil Co. (Indiana)..

Alamo Refining's complaint said the group of companies named as defendants pooled their catalytic-cracking patents, under an agreement which granted licensing powers to Kellogg or U.O.P. J. S. Abercrombie Co. and Harrison Oil Co., the complaint continued, Government lessees and wartime operators of the Sweeney plant, were "induced to acquire a license" under patents of the pool from U.O.P. in May 1944.

Alamo Refining said it declined to acquire the Sweeney plant until the U.O.P. license agreement was terminated since it was "of the belief the Fluid catalytic-cracking process employed by the said plant was not validly covered by any patent of the pool." The license was terminated, the complaint said, but later it was advised continued operation of the cracking processes at the Sweeney plant would infringe on the patents of the pool and was urged to accept a license under all of the patents of the pool.

Alamo Refining said the patents in the pool numbered in the hundreds and listed the 10 which it said had "colorable relevancy" to the Fluid process utilized at the Sweeney plant. None of these patents, or any others included in the pool, the complaint declared, can be "validly asserted against the plaintiff as infringed by the Fluid catalytic cracking process heretofore used by the said Sweeney plant or intended to be continued to be used by plaintiff at said plant."

The court also is asked to declare invalid patents owned by the defendants which are asserted to cover or to be infringed by the Fluid process used at the Sweeney plant. An injunction is sought to prevent the defendant companies from charging they own patents on the Fluid process used at Sweeney.

Rubber Consumption Reaches New High

The United States consumed more crude rubber during the first 7 months of 1947 than it used in any full year prior to World War II. Synthetic rubber made up more than half of the July total of 650,293 tons, an all-time record.

According to the report of the Rubber Manufacturers Association, the industry consumed slightly less reclaimed rubber during July than in the preceding month and approached a balance between natural and synthetic rubber. From January through July the industry used 351,229 tons of manufactured rubber as compared to 299,064 tons of natural rubber.

Bright-Stock Production Shows Drop in August

Production of bright stock during August was 271,061 bbl., a decrease of 14,654 bbl. from the previous month. July bright-stock output showed an 11 per cent increase over June.

A slight increase was noted in viscous neutrals which had a production of 508,129 bbl. for August as compared with 481,831 bbl. for July. Paraffin oils and blended oils also increased while steam-refined stocks decreased slightly from the previous month.

These figures are compiled by the Western Petroleum Refiners Association and are based on the operations of 13 reporting companies who manufacture oil in the midwestern area.

Berry Sons, Inc., Plans Dissolution of Company

The James B. Berry Sons, Inc., Independent plant, 2,800-bbl. refinery at Oil City, Pa., will be known in the future as The Quaker State Independent plant, due to recent dissolution measures taken by Quaker State Oil Refining Corp., the parent company. Other Berry subsidiaries of Quaker State will not be affected by the dissolution.

Pennzoil Waste-Treatment System Authorized

A permit for the construction of a waste-treatment system at the Rouseville, Pa., refinery of Pennzoil Co. has been granted by the Pennsylvania Sanitary Water Board.

Plans call for the construction and installation of two separators with a combined capacity of about 43,000 gal. The installation will avoid pollution of Oil Creek, according to the board. Eight such separators already are in operation by the refinery.

Chemical Association Plans Two Meetings

The first of two meetings which have been arranged for the Commercial Chemical Development Association has been scheduled for October 28, as announced by Dr. L. B. Hitchcock, president of the association. A report will be given at this meeting by J. H. Boyd on "The Commercial Chemical Development of Butadiene — Transportation and Handling." F. W. Lovejoy, sales executive for Socony-Vacuum Oil Co., Inc., will speak on "Selling at Times Like These."

Boyd, who is program chairman, said that a meeting for March 1948 also is assured. The association is concerned with the marketing and market expansion for manufactured chemicals.

Trucking Equipment Arrives To Move Canol Refinery

Details of plans for moving the plant and equipment of the Canol refinery from Whitehorse to Dawson Creek, B. C., for shipment by rail to Edmonton, Alta., have been announced. The plant was recently bought by Imperial Oil, Ltd. *(The Oil and Gas Journal, September 20, page 321).*

Three oversize semitrailer trucks, first of a fleet of eight owned by the Barnes Co., Los Angeles, have arrived at Dawson Creek by rail and left under their own power for Whitehorse. The trucks with trailers are about 50 ft. long, weigh 21 tons, and will carry 60-ton loads. Each truck has 23 tires, two front, eight drive, 12 trailer and one spare. Each wheel has its own air brake, to control the vehicle on icy roads, and all trucks are equipped with sand boxes.

Trucks will run 24 hours a day, an aluminum sleeping compartment being provided behind the cab where relief drivers can sleep. The round trip from Whitehorse to Dawson Creek and return over the Alaskan Highway will take 7 days. All bridges have been checked for clearance and strength; and it is planned to bypass the long Teslin bridge, built on piles set in silt, by means of a strong ice causeway, should the bridge fail to stand the 80-ton loads. A crew of 61 will be employed in dismantling the refinery and moving its 7,000-ton weight over the 1,300 miles of highway to the railhead.

Low Petroleum Prices Due To Increased Efficiency

Petroleum products are cheaper today than they were 20 years ago, Dr. Cecil L. Brown, assistant manager of Standard Oil Development Co., Elizabeth, N. J., said October 13 at a meeting of the North Jersey section of the American Chemical Society in Newark, N. J.

"Petroleum products, taken as a whole, cost about 90 per cent of their prices in 1926, while the over-all price level throughout the national economy is about 150 per cent above the 1926 level," said Brown, who is a former chairman of the society's petroleum division.

The petroleum industry has been able to maintain low prices by constantly increasing the efficiency of its utilization of crude oil, particularly through the development of the cracking processes for making gasoline, Brown explained. Available data indicate, he said, that the increase in crude-oil output was only slightly greater than the increase in gross national product from 1925 to 1945. In the same period, however, there was a 500 per cent rise in the volume of gasoline produced by cracking, as contrasted with an increase in the gross national product of about 110 per cent, he said.

Petrochemistry to Be Discussed at Exposition

Markets, manufacture, and properties of chemical derived from petroleum and natural gas will be among the numerous fields discussed at the 1947 Chemical Exposition of the Pacific Coast, to be held October 21-25 in San Francisco. The exposition is under the sponsorship of the California section of the American Chemical Society in collaboration with several other scientific and technical organizations.

Among the subjects to be discussed at this meeting are: synthetic detergents; chemistry and engineering in the oil industry; the fluid-solids technique; gasoline by polymerization of propylene and butenes; oil deterioration in an engine; laboratory distillation and other equipment; selemium compounds as lubricating-oil additives; effect of fuel volatility on aircraft fire hazards; aromatics from petroleum; filtration and distillation in process industries; and numerous other matters.

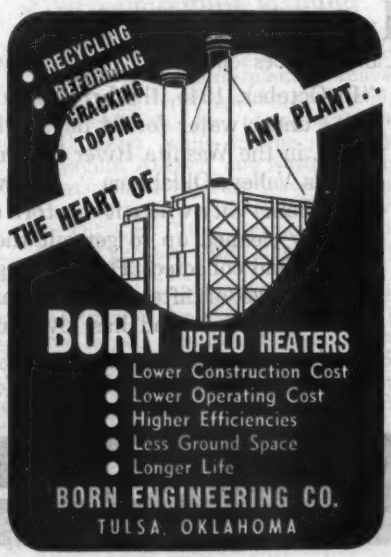
Fluid Principle Applied to Hydrocarbon Synthesis

Application of the Fluid catalyst principle to the synthesis of hydrocarbons of the motor-fuel range and heavier may simplify the so-called Fischer - Tropsch - type synthesis and make it competitive with present processes, according to a report by Bureau of Mines research technologists before the local section meeting of the American Institute of Chemical Engineers in Buffalo, N. Y. M. Leva, M. Grumer, M. Weintraub, and M. Pollchik, of the bureau's synthetic-fuels division at Pittsburgh, showed how this principle, already applied widely to catalytic cracking of heavier - than - gasoline petroleum fractions, results in higher yields and efficiencies, and tends to wipe out the economic disadvantage of the synthesized process.

As in Fluid catalytic cracking units the charge, a mixture of carbon monoxide and hydrogen gases, enters the bottom of a reactor partially filled with finely divided catalyst and passes upward through this bed, agitating it violently, and bringing hot gases and hot catalyst into intimate contact, effecting the combination of the gases to form hydrocarbons, alcohols, acids, aldehydes, and many other organic chemical compounds. The research is part of the bureau's program to develop principles and methods for synthesizing liquid hydrocarbons from natural gas, coal, etc.

Shell Buys Storage Site

HALIFAX, N. S.—Shell Oil Co. of Canada has purchased a site with a 300-ft. water frontage near the Acadia Sugar plant and will erect four storage tanks, a pier, and general office building. Possibility of a refinery at a later date is being studied.



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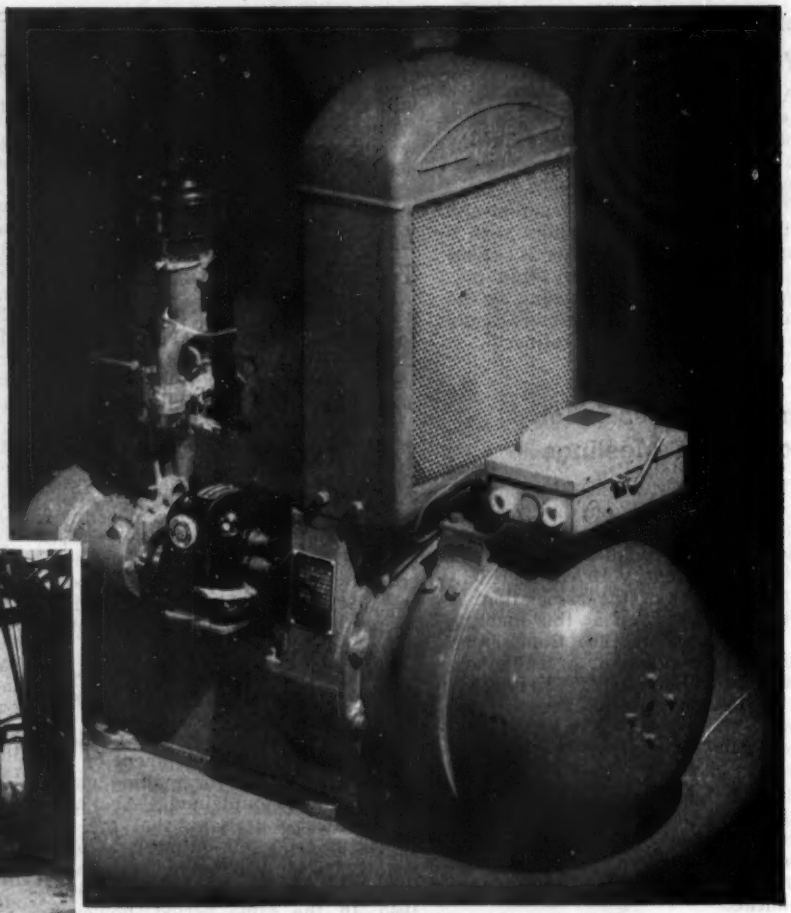

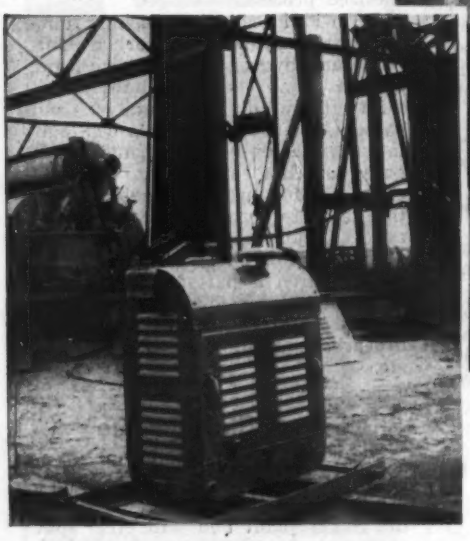

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IN the letter containing the above quotation, Mr. Callahan goes on to tell this interesting experience:

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NATURAL GAS

Texas Sweet Gas Price Set at 4 1-2 Cents

THE Texas Railroad Commission, under the requirement of a new law passed by the Texas Legislature, has announced market prices being paid at the well for Panhandle sweet and sour gas used for light and fuel purposes.

Weighted average market price for sweet gas, the commission said, is 4¼ cents per 1,000 cu. ft. at a pressure base of 16.4 psi.

The weighted average market price for sour gas was given as 3¾ cents per 1,000 cu. ft. at a pressure base of 16.4 psi.

Under the law, carbon-black manufacturers using sweet gas instead of sour gas in their production are required to pay the market price paid for sweet gas for light and fuel purposes as determined by the Railroad Commission at regular hearings. The first hearing was held September 4 in Amarillo.

The next hearing on Panhandle prices will be held in Amarillo, March 4, 1948..

Prior to the commission's announcement of the gas prices, carbon-black manufacturers were restricted to the use of sour gas or casing-head gas in their operations. The high sulfur content of sour gas made it undesirable for use as fuel. The law permits use of sweet gas if purchased at the average prevailing price and the recovery of carbon black is not less than 1½ lb. per 1,000 cu. ft.

Some sweet gas contracts are reported to be now quoting 6 cents, and these higher gas prices are expected to be reflected at the commission's next hearing.

In its ruling, the commission found the cost of desulfurizing sour gas to be ½ cent per 1,000 cu. ft. This is the amount of the differential between the prices determined for the two types of gas.

FPC Denies Request of Mississippi River Fuel

WASHINGTON.—The Federal Power Commission has denied a request by Mississippi River Fuel Corp. to omit the intermediate-decision procedure and render a final decision immediately on the company's application to construct facilities to increase delivery capacity of its system by 83,000,000 cu. ft. daily by the winter of 1948-49.

The commission in its consideration of the record failed to find that "due and timely execution of its functions imperatively and unavoidably" requires a final decision immediately.

Panhandle Eastern Gas Allocation Announced

WASHINGTON.—A new temporary plan for allocation of gas from the Panhandle Eastern Pipe Line Co. has been issued by the Federal Power Commission, to remain in effect until November 15 or until a plan for the balance of the winter can be announced.

In its findings FPC said Panhandle's total capacity for the coming winter will be 425,000,000 cu. ft., an increase of 20,000,000 cu. ft. over last winter, which will be augmented by continuation of the present allocation of 20,000,000 cu. ft. of Big Inch gas. Firm requirements of Panhandle's distributing customers have increased 78,000,000 cu. ft. daily over last winter and are 518,000,000 on a zero day, making a deficiency of 73,000,000 cu. ft. The interruptible load on the Panhandle system approximates 80,000,000 cu. ft. daily, so in extreme weather there must be complete curtailment of all interruptible loads and very considerable curtailment of firm loads.

Republic's Reinstatement Request Under Study

The Kansas Corporation Commission has taken under advisement the application of Republic Natural Gas Co. for reinstatement of canceled underages totaling 3,747,162,000 cu. ft. of gas to its 158 wells in the Kansas portion of Hugoton field.

A public hearing, which ended last week, resulted from a commission order July 31 shutting in 63 Republic wells for being overproduced more than three times their current monthly allowable.

At the hearing D. A. Howard, Dallas, vice president of Republic in charge of production, under examination by Robert C. Foulston, Wichita,, a Republic director, testified that if the underages were restored to both the A and B systems operated by Republic, there would be a net overproduction of only 144,575,000 cu. ft. a very small portion of Republic's monthly total allowable. He said he believed the underages should be restored for production within a year's time. This, he said, could be done without affecting the gas market and would be well within the capacity of the pipe-line facilities of Northern Natural Gas Co., its only purchaser.

Natural Gasoline

Burnell-North Pettus Cycling Plant Planned

Plans have been completed by operators in Burnell-North Pettus field for the construction and operation of a cycling plant to be located in Bee County, Texas. The plant will be operated by Stanolind Oil & Gas Co.

The plant is designed to handle 159,000,000 cu. ft. per day of high-pressure gas and return 123,000,000 cu. ft. per day to the formation. An additional 7,000,000 cu. ft. of casing-head gas now being flared will be processed through the plant and sold to United Gas Co., together with sufficient high-pressure gas to supply their requirements.

The design and construction is being handled by Jones & Laughlin Supply Co. Actual field construction is expected to start in the spring of 1948 with completion in about 1 year. The main absorber will operate at 1,600 psi. and gas will be injected at a maximum pressure of 3,400 psi. Approximately 7,000 bbl. per day of products will be produced which will consist of propane, butane, motor fuel, kerosine, and fuel oil.

Five Companies to Build Maysville Gasoline Plant

A natural gasoline plant at Maysville, Okla., to process approximately 100,000,000 cu. ft. of natural gas daily from wells in the Lindsay, Maysville, Antioch, and North Elmore areas, will be built by Warren Petroleum Corp. in partnership with Carter Oil Co., Cities Service Oil Co., J. E. Crosbie, Inc., and Sinclair Prairie Oil Co.

A recovery of 300,000 gal. per day is estimated from the gas which is now largely vented into the air and lost. Residue gas from the plant will be used in a repressuring program for the Antioch area and remaining residue gas will be sold to natural gas companies. The plant will be located about 2 miles west of Maysville and 8 miles east of Lindsay where acreage has already been purchased for a campsite and warehouse.

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Exploration and Drilling

Possible Big Clear Fork Pool in West Texas

RECENT developments in the south end of Goldsmith field in Ector County, Texas, plus those in Andector field, give rise to the possibility that a new Clear Fork pay field may be developing that will be 13 miles long

On the south end of Goldsmith, Gulf Oil Corp. 437 Goldsmith, in Section 28, Block 44, T-1-S, T&P Survey, indicated it would make a flowing producer from the Clear Fork. Two miles north, and slightly east of this well, Gulf's 439 Goldsmith had 200 ft. of Clear Fork pay, and on drill-stem test, indicated it was good for at least 40 bbl. per hour. On the north end of Goldsmith, in Section 12, Block "A," PSL Survey, there are Clear Fork producing wells. This indicates possible continuous Clear Fork production for 8 miles from No. 437 and 6 miles from No. 439.

The big Ellenburger discovery of Phillips Petroleum Co.-Texas Co. 1 McEntire, in Section 18, Block 44, T-1-N, T&P Survey, south of Andector field, had a drill-stem test on the way down, in the Clear Fork, indicating it was good for 25 bbl. per hour from that pay zone.

In Andector field, twin wells are now being drilled to the Clear Fork in Section 12, Block 45, T-2-N, T&P Survey. These wells are about 5 miles north and 2 miles west of the Clear Fork area in the north end of Goldsmith.

This gives a total stretch of about 13 miles north and south in which Clear Fork production might be established as continuous. There is nothing in the geological picture to make such an event impossible. On the contrary, there is evidence that it may well work out just that way.

Regionally, there is one big high extending for probably 25 miles or more from the south end of Goldsmith north and northwest. On this there are a series of local highs, which seem to influence the presence or absence of Upper Permian pays, but which are not necessarily of sufficient relief in the Permian to prohibit the possibility of continuous Clear Fork production over quite a long stretch.

The pre-Permian picture for this regional high remains somewhat cloudy. There will be, in fact there are now, several stretches of Devonian and Ellenburger production. According to the best evidence available at this time, the Devonian should lie completely around this regional high, and thin over the top of the structure from west to east, then thicken up on the east flank. The steep-dip side is to the east. The Devonian may be completely eroded over the top, in places, leaving bare Ellenburger immediately below the Permian. Or, the Devonian may thin, go across the saddles between the local highs on the regional high.

How much continuous Devonian and Ellenburger production will be established along this regional high will be determined only by the drill. Also, there is a question whether Devonian production on the west flank will merge into Ellenburger production along the top, or whether there will be a dry streak between Devonian and Ellenburger production.

The regional high has a somewhat curving north-south axis, and the east dip is very steep. Therefore there are possibilities that in the pre-Permian, areas that now seem to be separated by dry holes, may eventually merge, and drilling reveal that the edge of the field simply curves in and out, following the general curvature of the axis.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

SOUTH LOUISIANA.—Testing to start this week on Kerr-McGee's wildcat in Gulf of Mexico, 10 miles south of Point Au Fer. Five zones of saturated sand were reported between 1,508 and 1,742 ft., total depth. A new field is indicated for Vermilion Parish by Stanolind Oil & Gas Co. 1 E. M. Watkins.

COLORADO.—Continental Oil Co. and General Petroleum Corp. discovery in Fremont County is being completed for a gas well, preliminary tests showing a potential of 20,000,000 cu. ft. daily. At Hidden Dome the Madison test was a failure, thereby indicating limited production in the Tensleep.

WEST TEXAS.—Three tests are reported scheduled in the immediate vicinity of Texzona Producing Co. discovery well in Reeves County. In Hockley County a 5,000-ft. wildcat has been staked 2½ miles southwest of the 2-mile extension to Levelland field.

TEXAS GULF COAST.—South of Cedar Bayou in Chambers County, Kirby Petroleum completed its 2 Kirby fee as a 150-bbl. daily oil well at 6,400-07 ft. The 1 Kirby was completed as a gas-condensate producer at 6,312-16 ft. Amerada Petroleum Co. completed its discovery in the East Warren area of Tyler County for a 1,360,000-ft. gas well.

OKLAHOMA.—Stanolind Oil & Gas Co. may set a new deep-pay record for the state as its 1 Briscoe Unit in Grady County tested gas and distillate in the Bromide at 13,678-13,737 ft. In Caddo County, Magnolia Petroleum Co. recovered 2½ ft. of good sand on a core at 10,653-63 ft. at its 1 Miller-A.

KANSAS.—Barton County has a promising wildcat ½ mile east of Unrug pool, in the Arbuckle at 3,628-38 ft. In Barton County, Stanolind Oil & Gas Co. opened a new pool 2 miles north of Curtis field.

ILLINOIS.—In Clay County, T. B. Dirickson and Don Slape have a potential oil discovery at their 1 Buester. Calvert & Willis, Inc., had a favorable drill-stem test in the McClosky at 3,018-21 ft. at its Richland County test.

EAST TEXAS.—First Pettit oil production in the Jefferson field area of Marion County was recorded upon completion of P. H. Pewitt 1 Ralph. A new Rodessa test was staked for eastern Cass County, 5 miles northeast of Bivins.

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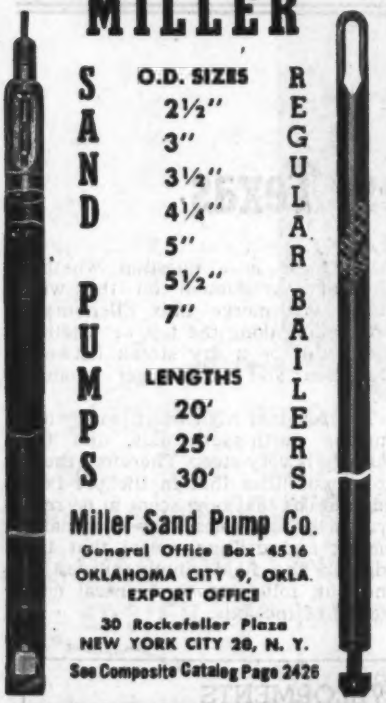

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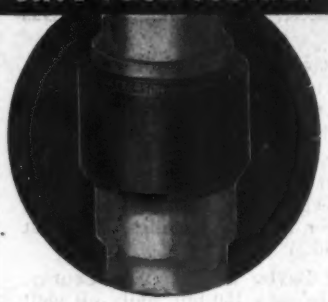

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TEXAS GULF COAST

New Chambers County Discovery Completed

HOUSTON.—Kirby Petroleum Co. et al 2 Kirby fee, Tract 20, Smith Survey, Frio sand oil discovery south of Cedar Bayou, Chambers County, has been completed flowing 150 bbl. of 37°-gravity oil daily through a ⅛-in. choke, tubing pressure 925 psi. and casing pressure 1,050 psi. Sand was topped at 6,397 ft., and production is through perforations at 6,400-07 ft.

This new discovery now is referred to by the operators as the Jergins field. The 1 Kirby was completed as a gas-condensate producer in the Marginulina formation at 6,312-16 ft. Location has been made for the 3 Kirby fee.

Final gage has been reported for Amerada Petroleum Co. 1 Charles G. Hooks, Cockfield gas discovery in the East Warren area of Tyler County. Total depth is 9,503 ft. On potential test flowed 1,360,000 cu. ft. of gas per day, through 12/64-in. choke, having an estimated open flow of 30,000,000 cu. ft. of gas per day. Flowing pressure on the tubing was 1,750 psi. Production is through perforations at 4,925-30 ft. Two tests in the Wilcox failed to show for commercial production, one at 7,609-20 ft. flowed 94 bbl. fluid per day, 20 per cent salt water, and 80 per cent 43°-gravity oil with 400-psi. working pressure. The other test of Wilcox from 7,736-39 ft. also showed oil and salt water. This well is located in the BBB&C Survey, Abstract 113, 6 miles east of Warren townsite and 7 miles northeast of South Hyatt field.

Pan American Production Co. 1 Drew Community, in the William Righter subdivision, Gillock gas area, Galveston County, has been completed as a good oil well. On potential test it flowed 113.66 bbl. of 39.4°-gravity oil daily through a 6/64-in. choke and gas-oil ratio 950, with 1,710-psi. flowing pressure on the tubing. Total depth is 8,450 ft., and production is through perforations at 7,888-7,902 ft.

Floyd L. Karsten 3-A Grogan Manufacturing Co., North Cleveland pool in Liberty County, made a potential flow of 132.48 bbl. of 42°-gravity oil daily through a 7/64-in. choke. Flowing pressure on tubing was 715 psi. Production is through perforations at 5,779-82 ft. Total depth is 5,790 ft.

In the Iago area of the south flank of the Boling dome in Wharton County, Cecil Hagen 4 A. C. Mick reported a potential gage of 216.68 bbl. of 30°-gravity oil per day through a 10/64-in. choke with 600-psi. flowing pressure on the tubing and 800 psi. on the casing. Production is through perforations at 4,722-26 ft. Total depth is 4,807 ft.

Amerada Petroleum Corp. 1 E. P. Stubblefield, east outpost test at Bloomington field, Victoria County, has run potential gage of 92 bbl. of 22.8°-gravity oil per day through a 7/64-in. choke, with 1,200-psi. tubing pressure, casing sealed. Production is through perforations at 4,640-45 ft. in the Greta sand, topped at 4,605 ft.

The 41 new locations for this week included 8 wildcats, 2 in Calhoun, and 1 each in Brazoria, Lavaca, Live Oak, Refugio, Tyler, and Victoria counties. One new oil discovery was completed in Chambers County, and one new gas pool was opened in Tyler County while 5 wildcats were dry, 1 each in Harris, Matagorda, Polk, Refugio, and Wharton counties.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Chambers County: Jergins oil discovery—Kirby Petroleum Co. 2 Kirby Pet. Co. fee Tract 20, in C. Smith Sur., Abst. 22, 933 ft. E of 1 discovery, gas-condensate well, TD 6,448 ft., perforations 6,401-07 ft. Frio sand, IP: 149 bbl. oil per day through ⅛-in. choke, TP 925 psi., CP 1,050 psi., gravity 37°, no water.

Tyler County: New gas pool—Amerada Petroleum Corp. 1 Chas. G. Hooks, BBB&C Sur., Abstract 113, 6 mi. E of Warren townsite, 7 mi. NE of South Hyatt field and 9 mi. W of Joe's Lake field, TD 9,503 ft., top Wilcox 7,583 ft., perf. 4,925-30 ft., IP: 1,360,000 cu. ft. gas per day through a 12/64-in. choke, and estimated 30,000,000 cu. ft. gas per day open flow, TP 1,750 psi., no water.

TEXAS GULF COAST WILDCAT FAILURES

Harris County: D. C. Cheesman 1 O. P. Hairgrove, in J. Sullivan Sur., 3 mi. NW of Aldine, dry, TD 7,520 ft. in sidetracked hole.

Matagorda County: Texas Co. 1 Frank Gillespie et al, in R. Lawder Sur., Abst. 350, 5.3 mi. NW of Palacios and approximately 3½ mi. N of Buttermilk Slough field, dry, TD 11,016 ft.

Polk County: Sam H. Harper 1 J. S. Murphy et al, in Jas. S. Garner Sur., 3 mi. W of Livingston townsite and 8½ mi. NW of Goodrich field production, dry, TD 1,025 ft.

Refugio County: Hewit & Dougherty 1-F F. B. Rooke & Sons, in Antonio de la Vina Grant, 1 mi. SW of Woodsboro and 2 mi. NE of Roche field, dry, TD 7,899 ft.

Wharton County: United North & South Development Co. et al 1 J. A. Halamicek, I&GN Sur., Sec. 4, 5 mi. NW of El Campo, dry., TD 4,642 ft.

SOUTH LOUISIANA

Vermilion Wildcat Flows At 179-Bbl. Daily Rate

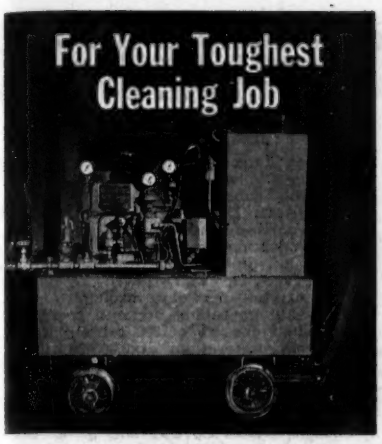
NEW ORLEANS.—Stanolind Oil & Gas Co. 1 E. M. Watkins, wildcat discovery 6 miles east of Florence townsite in Vermilion Parish, Section 23-13s-1w, flowed at the rate of 179 bbl. of oil per day on a drill-stem test through perforations at 7,070-73 ft., using 6/64-in. chokes, with 1,000-psi. flowing pressure and a gas-oil ratio fluctuating between 1,200 and 450. Total depth is 12,191 ft., and 7-in. casing is cemented at 10,900 ft. and 5-in. liner to 11,990 ft.

An initial test was attempted with perforations from 11,310-26 ft. It developed a 4,300-psi. pressure using 10,500 ft. of cushion, but casing difficulties developed and a flow test was never made due to unsuccessful fishing operations. Another test was then made with new perforations shot from 9,279-82 ft. At this level, the well flowed at the rate of 206 bbl. of oil per day for 13 hours, then went to 90 per cent salt water. A third test was made of perforations 9,285-90 ft. and the well flowed dry gas with 1,200 psi. which dropped to 475 psi. in 16 hours, then died completely. Tester was pulled, and a recovery of oil-cut mud and salt water was made.

Stanolind 1 H. C. Bucklin, wildcat 1½ miles south of production in South Elton field of Jefferson Davis Parish, blew out and stuck drill pipe at 9,951 ft., but was immediately brought under control. The test is in Section 4-8s-3w, and is projected to 10,000 ft.

Superior Oil Co. of California 2 State-LLE, Unit 12, discovery well on the east side of the Four Isle dome in Terrebonne Parish, 24-21s-16e, has been completed as a high-gravity oil and gas producer. Last gage reported was 180 bbl. of 48.4°-gravity condensate per day through a 16/64-in. choke with 4,300 psi. on the tubing and a gas ratio of 30,555, no water. Total depth is 14,220 ft., with 7-in. pipe cemented at 14,028 ft. Completion is through perforations at 13,455-65 ft. Gas and condensate production was also indicated on a test with perforations at 12,770-80 ft. At that level the well flowed at the rate of 2,000,000 cu. ft. of gas with a small amount of 57.4°-gravity condensate and 2,200-psi. flowing pressure.

Lloyd H. Smith 1 Bacque & Guidry, wild-



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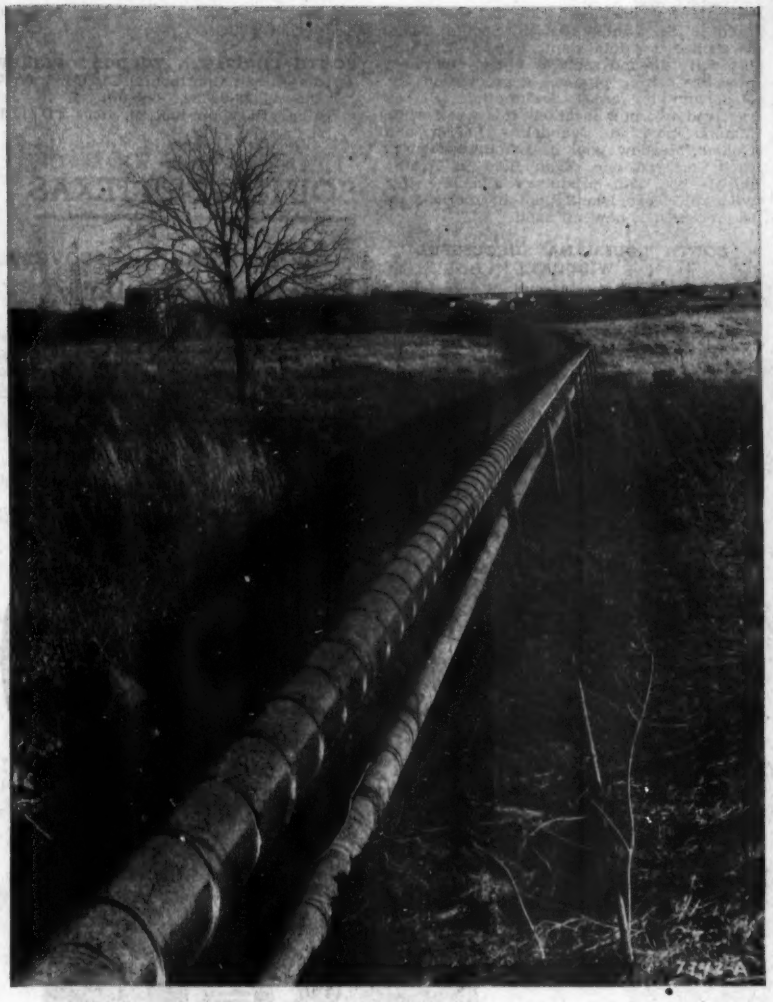

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cat off the northeast side of the Bosco field in St. Landry Parish, Section 25-8s-3e, drilled to a total depth of 6,500 ft. where log was run and samples taken. Operators now are setting pipe for a production try. Napoleonville area, Assumption Parish, received two new locations this week while Mamou pool in Evangeline Parish and Golden Meadow pool in Lafourche Parish each received one. Egan field in Acadia Parish had two producers and one dry wildcat. Weeks Island pool in Iberia Parish received a new oil sand.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Iberia Parish: New oil sand, Weeks Island —Humble 3-B J. M. Burguieres Co., Ltd., 44-14s-7e, off SE side of dome, TD 12,551 ft., top sand 11,662 ft., perf. 11,662-705 ft., IP: 260 bbl. oil per day through 9/64-in. choke, gas-oil ratio 354, TP 1,400 psi., gravity 33.7°, 0.2 per cent water.

SOUTH LOUISIANA WILDCAT FAILURE

Acadia Jarish: Continental Oil Co. 1 W. W. Duson, 18-9s-2w, 1½ mi. E of Jennings field production, dry, TD 12,512 ft.

SOUTHWEST TEXAS

La Salle County Discovery Flows 30 Bbl. Oil Daily

CORPUS CHRISTI. — Newman Brothers Drilling Co. and Skinner & Eddy Corp. 1-D South Texas Syndicate, discovery well approximately 1 mile southeast of the east end of Washburn field, in La Salle County, flowed about 30 bbl. of pipe-line oil per day, no water, from the open hole at 5,248-53 ft. in the Wilcox zone. Total depth is 5,253 ft., with 5½-in. casing set to 5,248 ft. This well is located in the G. W. von Roeder Survey 60.

Lonnie Glasscock 1-A Kansas City Life Insurance Co., wildcat, in the F. Z. Bishop Palo Alto subdivision, ¾ mile east of nearest Agua Dulce field production and ⅝ mile north-northeast of nearest Stratton field production, has been completed as a small low-pressure oil producer. On potential gage the well flowed 27 bbl. of 42°-gravity oil per day through a ½-in. choke, with no tubing pressure registered, and casing pressure of 300 psi. Production is through perforations at 6,305-25 ft. Top of pay 6,305 ft.; total depth 7,224 ft. This is a rework job on old dry hole, located in Section 196, F. Z. Bishop Palo Alto subdivision.

Coastal Refineries, Inc. and M. L. Massingill 1-A Garcia Land & Livestock Co., new oil-field discovery in southwestern Hidalgo County, approximately 6 miles north-northeast of Sullivan City and 5 miles northwest of Samfordyce, is still testing, with salt-water content in the flow now reduced from 50 per cent to 25 per cent. It flowed 115 bbl. of fluid per day through a 9/64-in. choke, with 1,040-psi. tubing pressure and 1,400-psi. casing pressure through perforations at 4,020-23 ft. Total depth is 5,368 ft., and 5½-in. casing set to 4,675 ft. This well is located in Porcion 43.

Humble Oil & Refining Co. 1 Nelle-Gordon-Dinsmoore, discovery well in the Edwards lime in East Imogene field, Atascosa County, gaged 2.95 bbl. of 35°-gravity oil per day through 3/16-in. choke, with 30-psi. tubing pressure, 170-psi. casing pressure, and gas-oil ratio of 3,095. The test was through perforations at 8,093-8,104 ft. This well is located 5 miles east of Imogene field and 5 miles west-northwest of Mull field.

Humble 1 W. R. Nicholson, wildcat in Webb County, 13 miles north-northwest of Carolina-Texas field and 12 miles west-northwest of Lopez field, flowed gas again on production test through perforations at 5,574-77 ft., flowing at the rate of 800,000 cu. ft. per day through a ¼-in. choke, with tubing pressure 1,500 psi. On a previous test through perforations at 5,565-72 ft., well had flowed gas-condensate, with 1,375-psi. working pressure through a ¼-in. choke. Total depth is 5,816 ft. with 5½-in. casing set on bottom. This well is located in BS&F Survey 985.

Continental Oil Co. 1-S J. F. Welder, wildcat in southern San Patricio County, near the Nueces County line and 4 miles northwest of Calallen, recovered 150 ft. of pipe-line oil and 30 ft. of oil-cut mud, with 350-psi. working pressure on drill-stem test at 5,428-36 ft., open 30 minutes. Operators are now coring ahead below 5,436 ft. This well is located between the small producing areas known as Angelita field and O'Neil field, in the Victoria Tares and Pedro Villareal Survey, A-32, 5 miles south-southeast of Edroy.

Babb & Dillard 1 Wardlaw, wildcat approximately 14 miles from the north line and 8 miles from the west line of Edwards County, has been completed pumping 25 bbl. of oil per day, 18° gravity. Total depth is 248 ft. with top of oil sand at 237 ft. The 7-in. casing was set to 60 ft. The well is located in GC&SF Survey 7, Block F.

The 44 new locations reported this week included 14 wildcats, 3 in Starr, 2 each in Atascosa, and Duval, and 1 each in Caldwell, Jim Hogg, Kinney, La Salle, Nueces, Webb, and Zapata counties. One successful wildcat was completed in Nueces County while 4 were dry holes, 2 in Duval and 1 each in Nueces and Williamson counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCAT

Nueces County: New oil pool, Agua Dulce area—Lonnie Glasscock 1-A Kansas City Life Ins. Co., F. Z. Bishop Palo Alto Subd., ¾ mi. E of nearest Agua

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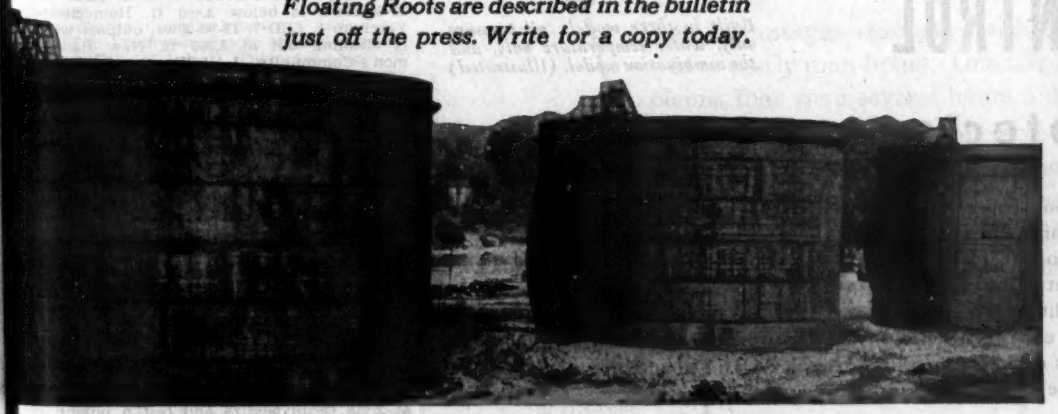

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Dulce field production and ⅜ mi. N-NE of nearest Stratton field production, rework job of old dry hole, TD 7,224 ft., top pay 6,305 ft., perf. 6,305-25 ft., IP: 27 bbl. oil per day through a ½-in. choke, no gas, TP zero, CP 300 psi., gravity 42°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Duval County: Sid Katz' 1 Lucille Gruy Est., on S. G. Haynes Sur., 1½ mi. S of Rancho Solo field, dry, TD 3,138 ft.

V. G. Schimmel et al 1 J. T. Dinn, in T&NO RR Sur. 142, 1½ mi. E-SE of Richardson field, dry, TD 2,700 ft.

Nueces County: Monday Oil Co. and Geo. B. Buescher 1 J. F. Imken et al, F. Z. Bishop Subd. of Weil ranch, 5 mi. NW of Bishop and ¾ mi. E of Stratton field, dry, TD 7,513 ft.

Williamson County: B. P. Cavnar 2 Wm. Fuch, 3 mi. SE of Thrall, in Hamilton White Sur., dry, TD 1,250 ft.

CANADIAN FIELDS

Northern Alberta Wildcat Coring

CHATHAM.—In the central plains area of northern Alberta, Westlock Petroleum's 1 Langille, LSD 13, 14-59-26w4, encountered Devonian limestone around 3,517 ft. and is coring after reaming to bottom at 3,632 ft. Most of the lime has displayed pin-point porosity, with cores bubbling oil and showing a little gas. The test has still to reach any of the three main porous horizons encountered in Leduc field.

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BATTERY IGNITION APPLICATIONS. Opens battery circuit and sounds an alarm . . . sounds an alarm only . . . opens battery circuit only.

MAGNETO IGNITION APPLICATIONS. Sounds an alarm only . . . grounds single or dual magneto . . . grounds magneto and sounds an alarm or lights a signal light.

DUAL IGNITION APPLICATIONS. Opens battery circuit and grounds magneto.

PENN AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, ENGINES, PUMPS AND AIR COMPRESSORS

Leduc.—Successful completion of Globe-Leduc West 1 and 2 in the past 6 weeks has materially extended the producing area and practically doubled the life potential of the field, to a point where it ranks third among Canadian producing areas, exceeded only by the Turner Valley and Fort Norman fields. Following the completion of Imperial's discovery well in February, Imperial followed a policy of drilling offset wells, the first four producers defining an area more than 3 miles long and up to a mile wide. The Globe-Leduc West wells in widely separated sections have extended the field 2½ miles to the west and 1½ miles to the northwest. Field potential is now estimated at 35,000,000 bbl. of 40-41°-gravity oil. Two other key wells now drilling will help define the field in other directions. These are East Leduc 1, LSD 8, 9-50-26w4, ¾ mile south of Imperial 2 producer and drilling below 4,355 ft.; and East Leduc 2, LSD 10, 5-51-25w4, 3 miles northeast of the proven area.

Leduc Consolidated 2, LSD 7, 23-50-26w4, testing at 5,358 ft., with a few feet of porosity above the water line in the third zone has been flowing by heads and gradually clearing; oil coming in after more than 1,000 ft. of mud and water had been cleared. Production is being run into storage, but potential has not been announced.

Imperial 8, LSD 7, 26-50-26w4, previously confirmed as a producer, had 183-bbl. initial production through 5/32-in. bean. Imperial 11, LSD 9, 21-50-26w4, bottoming at 5,115 ft., flowed 278 bbl. on a perliminary test. Imperial 12, LSD 12, 22-50-26w4, finished drilling at 5,291 ft. and has been placed on steady production. Imperial 13, LSD 4, 23-50-26w4, finished at 5,358 ft., made 141 bbl. in 24 hours through 11-64-in. choke, later increasing to 162 bbl. Imperial 14, LSD 9, 26-50-26w4, bottoming at 5,310 ft. and cased to 5,295 ft. in the second porous, is flowing intermittently. Three other tests are drilling, with three additional locations.

Globe-Leduc West 1, LSD 6, 19-50-26w4, is being placed on steady production, after drill-stem test at 5,064-90 ft. showed around 75 bbl. an hour initial flow. Globe-Leduc West 2, LSD 9, 34-50-26w4, is on steady production after interruption due to lack of storage. Globe-Leduc West 3, LED 10, 34-50-26w4, is below 2,460 ft. Homestead-Yaremko 1, LSD 7, 19-50-25w4, outpost well, is cleaning out at 5,365 ft. New Ranchmen's-Community 1, LSD 11, 7-49-24w4, south and east of the field, has been abandoned at 5,550 ft.

Millett-Leduc 16-6, south of the field, in LSD 16, 6-48-24w4, after drilling into green shale without encountering the third zone, has entered an argillaceous limestone, a formation new for the field, and is deepening below 5,923 ft. for possible porosity.

Jumping Pound.—West of Calgary, Shell 5-7-1, LSD 5, 7-25-4w5, discontinued drilling 238 ft. in the Cambrian at 14,443 ft. The well got the Devonian at 12,225 ft. It is plugging back to 10,200 ft., approximately 400 ft. in the Madison limestone, to test a heavy flow of wet gas.

Hanna.—In the Hanna area, southern Alberta, Co-Op 1, LSD 3, 13-31-15w4, bottoming at 5,100 ft., after an unsuccessful test of the Devonian limestone, has set pipe at 3,756 ft. to acidize and test a potential oil horizon in the Madison. Rig is being moved to 17-31-15w4 for a second test. Berry Creek 1, LSD 3, 9-31-14w4, bottoming at 4,286 ft. with a good gas flow and strong oil indications, is waiting for tubing to complete production tests. Completion of Alliance 4, LSD 1, 5-32-14w4, from 187 ft. has been taken over by British-American Oil Co., which will develop Alliance holdings of 19,800 acres.

Pakowki.—In the border area, McColl-Union 6-D-17, LSD 6, 17-5-5w4, has finished at 2,770 ft. with a good gas flow in the Bow Island sand, the completion extending the field 2 miles east of Pakowki. McColl-Union 7C-27, LSD 7, 27-2-10w4, has been abandoned at 1,863 ft.

Lloydminster.—In the Alberta section of Lloydminster field, Win Lloyd 1, LSD 6, 16-50-1w4, finished at 1,971 ft., has initial production of 80 bbl. Win Lloyd 5, same

section, is testing at 2,040 ft. L.O.P. 2, LSD 9, 9-50-2w4, finished at 1,990 ft., has been abandoneed. L.O.P. 7, SW 12, 11-50-2w4, at 2,010 ft. is being placed on pump. L.O.P. Syndicate 1, LSD 14, 11-50-2w4, has finished a produced at 1,992 ft.

OKLAHOMA

Three Deep Wildcats Hold Oklahoma Interest

OKLAHOMA interest was focused this week on three deep wildcat tests which are in the pay or look hopeful. In Grady County, east of Chitwood area, Stanolind Oil & Gas Co. has opened the deepest production in the state with its 1 Briscoe Unit, C NW SE 4-4n-5w. The test flowed an estimated 9,500 M.c.f. of gas with a good spray of distillate through ¾-in. choke on drill-stem test of Bromide at 13,678-13,737 ft. With choke changed to ¼-in. it flowed 1,800 M.c.f. gas per day with distillate spray. Recovery of distillate was 1,350 ft. After the two tests, coring continued in a search for main Bromide sand.

Magnolia Petroleum Co. is operator for the other two interesting wildcats. In Caddo County, Magnolia 1 Miller-A, SE NW NE 14-6n-9w, cored in Pennsylvania from 10,653-63 ft. recovering 2½ ft. of very good sand with stain and odor and 7½ ft. of sandy shale with poor stain and odor. In Dewey County near Vici, a drill-stem test was made at 13,722-44 ft. in Wilcox on 1 Winters, C SW NE 9-19-20w, with undisclosed results.

Faultline Oil Co. has opened a new oil field east of south end of Moore field in northern Cleveland County with its 1 School Land, C NE NW 36-10n-2w. The well flowed at rate of 25 bbl. of oil per hour through ¼-in. choke from perforations in Wilcox at 7,138-7,212 ft. Gas-oil ratio was 775 to 1. Production was indicated in Hunton lime and Bartlesville sand by drill-stem tests, but these sands were shut off with casing.

In Garvin County, producers have been added to Northwest Elmore and Katie pools. Carter Oil Co. 1 J. D. Thompson, NW NE SE 15-2n-2w, on the west side of Northeast Elmore, flowed 60 bbl. in 4 hours through ¼-in. choke. Casing was perforated at 6,567-72 ft. and tubing pressure ranged from 250-550 lb. In Katie pool, Dale Rorem 1-B fee, C NW NE 6-1n-1w, flowed natural after being washed in with oil. Casing is set at 6,183 ft. and total depth is 6,236 ft.

Six counties—Carter, Cotton, Creek, Hughes, Seminole, and Stephens—accounted for 38 of the state's 64 new locations for the week. Hughes, Seminole and Stephens were also among the leaders in completions. These three along with Garvin, Okfuskee, and Oklahoma completed 40 of the 65 wells finaled in the state.

OKLAHOMA SUCCESSFUL WILDCATS

Okfuskee County: Oil & Gas Ind. 1 Callahan, NE NE NW 24-12n-9e, pumped 60 bbl. of 29°-gravity oil per day from sand at 3,132-50 ft., TD 3,150 ft.

Jergins 1 Replogle-Slepka, SE NE NW 34-12n-10e, flowed 30 bbl. of oil per day from Cromwell at 3,176-92 ft., TD 3,192 ft.

Oklahoma County: Extension to Oklahoma City pool—Cities Service 5 Farley, SW NE NW 19-11n-2w, flowed 66 bbl. of oil per day from Basal Pennsylvanian-Arbuckle at 6,092-6,105 ft., through a 10/16-in. tubing choke, TD 6,344 ft.

Stephens County: Mudge 1 Sembritzky, SE NW SE 24-1n-7w, flowed 160 bbl. of 40.5°-gravity oil per day from sand at 7,170-88 ft., through a ¼-in. tubing choke, TD 7,188 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Crawford 1 Cagle, NE NE SW NW 5-3s-10w, dry, TD 1,608 ft., sand 1,240-43 ft. and 1,332-35 ft. with

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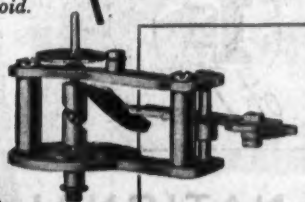

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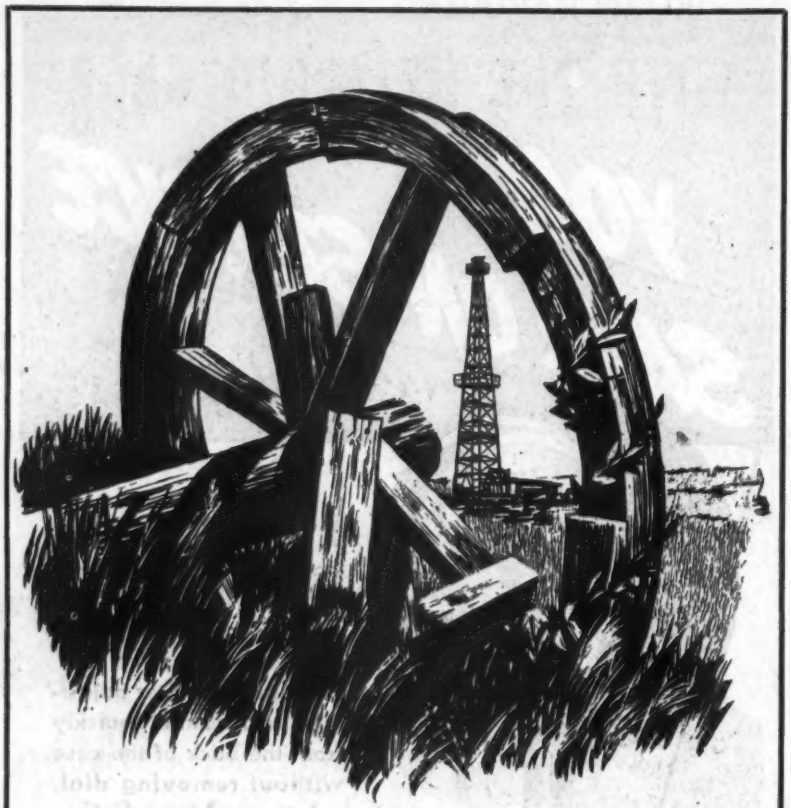

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a show of gas, sandy shale 1,528-37 ft.

Hughes County: Delaney 1 Parker, NE NE SW 21-5n-9e, dry, TD 2,925 ft., no tops reported.

Jefferson County: Bridwell 1 Settlemires, SW SW NE 5-5s-8w, dry, TD 3,060 ft., Ellenburger 2,860 ft.

Markham Prop. 1 Anderson, SW SW NW 32-7s-6w, dry, TD 2,505 ft., Canyon 2,375-90 ft., Arbuckle 2,390 ft.

Kiowa County: Potts 1 Beach, NW NW SE 29-7n-20w, dry, TD 1,272 ft., no tops reported.

Okfuskee County: Wilcox 1 Woodward, NE SW NE 13-12n-9e, dry, TD 3,792 ft., no tops reported.

Seminole County: Deep Rock 1 Carter, NE NE NE 27-8n-7e, dry, TD 4,400 ft., Viola 4,275 ft., Wilcox 4,389-94 ft.

Stephens County: Jergins 1 Saunders, NE NE NW 3-3s-6w, dry, TD 2,701 ft., Basal Pennsylvanian and Hoxbar 1,150 ft., Canyon lime 1,190 ft., Basal Pennsylvanian 2,275 ft., Lower Simpson shale 2,355 ft.

Tillman County; Johnson 1 Bowlby, NE NW NW 7-3s-14w, dry, TD 2,137 ft., lime 950 ft., Granite wash 1,499-1,555 ft. and 1,832-45 ft., lime 1,910-30 ft., sandy lime 2,049-57 ft., Granite wash 2,083-96 ft., lime 2,130-34 ft.

Baldwin 1 Gossett, SW SW NW 10-3s-14w, dry, TD 1,231 ft., no tops reported.

KANSAS

Barton County Wildcat Looks Good On Test

KANSAS NEBRASKA OIL & GAS CO. has a promising looking wildcat ½ mile east of Unrug oil and gas pool, Barton County. The test, 1 Moore, C SW SW 18-20-14w, yielded oil and water from the Arbuckle through perforations at 3,628-38 ft. Arbuckle lime was topped at 3,591 ft. and 5-in. casing set at 3,650 ft., total depth.

Mississippi lime pay has been struck by Aladdin Petroleum Co. in the Schulte (Simpson sand) pool, southwest of Wichita, Sedgwick County. Aladdin's 2 Dugan, SE NW SE 7-28-1w, offsets a big Simpson sand well, but found the Simpson dry. Drill-stem test of Mississippi sand recovered more than 2,000 ft. of oil. A flow test at 3,384-88 ft., through perforations, produced 112 bbl. of oil in 12 hours through ¾-in. choke.

Nadel & Gussman et al 1 Stoskopf, SW SW NW 22-17s-13w, 2 miles north and 1 mile east of Hoisington, Barton County, has reached good saturation in Arbuckle at 3,426 ft. This test is a north offset to a recent discovery of Derby Oil Co. and Kiowa Drilling Co. which extended Hoisington pool ½ mile east.

A new pool has been opened in Stafford County by Stanolind Oil & Gas Co. Discovery well is 1 Otto Pundsack, SE SE SW 19-21-13, 1¾ miles west of Hazel pool and 2 miles north of Curtis pool. After 500 gal. acid treatment, the well had a physical potential of 92 bbl. from Arbuckle with total depth of 3,743 ft. Top of Arbuckle was 3,735 ft.

The abandoned Powell pool in Butler County has been reopened by Don Ingling with his 1 Powell, NE NW SE 12-24-3e, 5 miles east of Whitewater. The well tested 15 bbl. of oil from Mississippi lime and considerable water. It was drilled into Mississippi at 2,467 ft. and bottomed at 2,481 ft.

Barton, Butler, and Rooks counties led the state in new locations for the week with eight, six, and seven respectively. The same counties, along with Ellis, accounted for a major portion of the week's completions. Six new wildcat locations were announced with two each for Ellis and Rooks counties, and one each for Stafford and Cowley.

KANSAS SUCCESSFUL WILDCAT

Stafford County: Musgrove Petroleum 1 Lanterman, NW NW NW 23-22s-12w,

produced 1,842 bbl. of 40°-gravity oil per day from Arbuckle at 3,676-79 ft.; anhydrite 643 ft., Lansing-Kansas City 3,304 ft., Viola 3,576 ft., Simpson 3,622 ft., TD 3,679 ft.

KANSAS WILDCAT FAILURES

Butler County: J. P. Gaty 1 Randall, SW NW NW 11-29s-3e, dry, TD 3,005 ft., Lansing-Kansas City 1,980 ft., Kansas City 2,262 ft., Mississippi lime 2,760 ft., Simpson 2,968 ft.

Comanche County: Stanolind 1 R. I. Winkler, NE NE NW 6-31s-19w, dry, TD 6,036 ft., anhydrite 1,073 ft., Lansing-Kansas City 4,382 ft., Mississippian 5,018 ft., Arbuckle 5,980-6,036 ft.

Cowley County: Ed Adair 1 Loew, NW NW NE 12-32s-5e, dry, TD 3,081 ft., Layton 2,314 ft., Kansas City 2,450 ft., Bartlesville sand 2,967 ft., Mississippian 3,072 ft.

Ellis County: Mid-Continent Petroleum Co. 1 Fischer "A," NE NE SW 5-11s-20w, dry, TD 3,699 ft., anhydrite 1,500 ft., Heebner 3,302 ft., Lansing-Kansas City 3,337 ft., conglomerate 3,602 ft., Arbuckle 3,648 ft.

H. H. & B. and Phillips Petroleum 1 Hazelhorst, NW NW NE 23-14s-20w, dry, TD 3,805 ft., anhydrite 1,390 ft., Heebner 3,390 ft., Lansing-Kansas City 3,432 ft., Marmaton 3,759-63 ft., Arbuckle 3,772 ft., Regan 3,799 ft.

Ottawa County: Westgate-Greenland 1 Beverly, SE SE SE 17-11s-2w, TD 3,646 ft., Mississippian 2,723 ft., Hunton 3,142 ft., Viola 3,283 ft., Simpson 3,570 ft., Arbuckle 3,613-46 ft.

Pawnee County: Brack Oil 1 Cutter, SE SE SW 11-21s-15w, dry, TD 3,865 ft., anhydrite 888 ft., brown lime 3,394 ft., Basal Kansas City 3,406 ft., conglomerate 3,681 ft., Viola 3,720 ft., Simpson 3,756 ft., Arbuckle 3,790 ft.

J. M. Huber & Goodpasture 1 Thompson, NW NW NE 8-22s-15w, dry, TD 3,978 ft., Heebner 3,398 ft., Basal Oread 3,440 ft., brown lime 3,504 ft., Lansing 3,515 ft.

Rooks County: Bennet & Roberts & Vickers 1 Oudraseck, SW SW NE 5-19s-19w, dry, TD 3,545 ft., Topeka 3,008 ft., Heebner 3,215 ft., Lansing-Kansas City 3,239 ft., Arbuckle 3,511-45 ft.

Saline County: R. J. Wilson 1 Karber, SE SE SW 34-15s-1w, dry, TD 2,700 ft., Mississippian 2,605 ft.

LA.-ARK.

1 Bailey Johnson Drilling Ahead After Tests

EL DORADO.—Eighteen miles east and 4 miles south of Texarkana and about 5 miles east of Fouke field, Miller County, A. E. Stewart et al 1 Bailey Johnson, 29-16s-25w, recovered 360 ft. of 30°-gravity oil and 60 ft. of oil-cut mud from the Glen Rose limestone at 3,994-4,005 ft. The tool was open 3 minutes, during which time working pressure was only 20 psi., with a flowing bottom-hole pressure of 850 psi. Operators reported a drilling break at 3,998 ft., with cuttings showing oil. Cored from 4,002-05 ft., the recovery was 2 ft. of fine sand with stain and odor and 1 ft. of shale. On an elevation of 233 ft., sample tops reported were Tuscaloosa 3,070 ft. and Paluxy 3,140 ft. Operators were drilling ahead below 4,150 ft.

McAlester Fuel Oil Co. 1-A Paschal, 19-15s-20w, Columbia County, reperforated at 6,526-41 ft., then made a 31-hour drill-stem test of the interval, recovering mud and then salt water. After swabbing down to 4,800 ft., the salt water showed some gas and a very slight show of oil. A second test at 6,505-41 ft. failed, and the hole was plugged back to 3,800 ft. to test the Pettit. First perforations between 3,749-50 ft., were squeezed with no report of a test.

In Lafayette County, Barnsdall Oil Co. and G. H. Vaughn 1 Bodcaw, 8-18s-23w, was drilling ahead below 9,640 ft., and thought to be in the Smackover. Cores at 9,250-60 ft. recovered soft, gray porous oolitic limestone with slight sulfur odor. A drill-stem test at 9,452-60 ft., using 720-ft. water cushion, produced a good blow, recovering the cushion plus 5,130 ft. of sulfur water slightly cut with gas, in 44 minutes. North of the Lewisville field, McAlester Fuel 1-A Shewmake estate, 7-16s-23w, was drilling below 4,699 ft. A test at 4,604-13 ft., open 18 minutes, recovered 200 ft. of water cushion and 10 ft. of mud, with no shows.

In Desha County, Zeke Lohman 1 Stimson Trust, 10-10s-3w, was drilling in sidetracked hole after reaching total depth of 4,854 ft. on its 5,000-ft. objective. At 4,854 ft. a lost drill stem was recovered and an attempt to run electric log was fouled up when it encountered a bridge at 1,200 ft. The wildcat is located 6 miles southeast of Dumas.

North Louisiana exploration activity continued at a good pace. In Union Parish, Pan American Producing Co. 1 Elva Bugg, 31-20n-1w, which has been showing for some kind of a distillate discovery, was coring below 8,700 ft., and thought to be still in the Cotton Valley. A drill-stem test between 8,395-8,423 ft., using ¼-in. chokes and open 4 minutes, recovered dry gas and 9 stands of water cushion having a small amount of distillate.

In Catahoula Parish, General American Oil Co. 1 S. H. Calvert was said to be showing gas in the Tuscaloosa but operators had no official comment, reporting no shows in coring below 9,465 ft. Electric log showed base of the Wilcox and top of the Midway at 6,892 ft. Southwest of Larto Lake field, Hunt Oil Co. 1 Louisiana Delta Lumber Co., 6-4n-5e, was coring below 5,808 ft. in sand, with no shows.

Lion Oil Co. 1 Colbert, 14-17n-6w, Bienville Parish, was coring below 7,090 ft. in the lower Glen Rose. Sulfur water was

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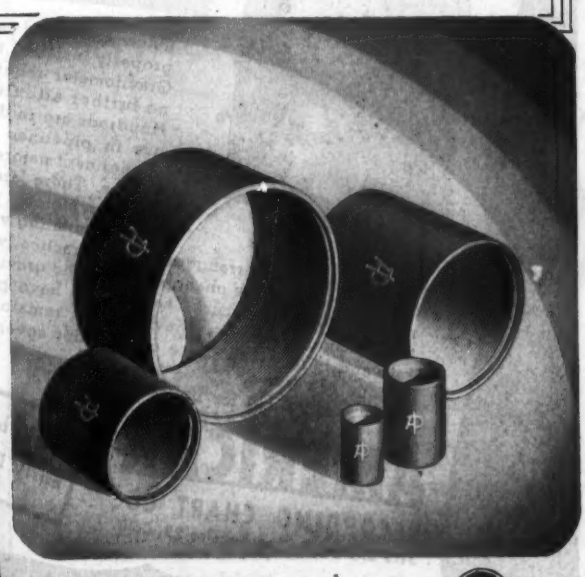

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found in the James limestone, topped at 6,318 ft.; top on the Pettit was 6,830 ft., both by samples.

In Claiborne Parish, Carter Oil Co. 1 Gandy, 28-19n-7w, was coring at 7,535 ft., still in the Travis Peak topped at 6,950 ft. Hassie Hunt 1 James, 10-22n-4w, north of North Lisbon field, was said to be coring at 10,337 ft. and presumably in the Smackover. In DeSoto Parish, Skelly Oil Co. 1 Nash, 20-12n-16w, had a fish job at 11,545 ft. Operators were preparing to whipstock at 11,345 ft. H. L. Hunt 137-F Goodpine, 20-9n-4e, LaSalle Parish, was coring at 7,574 ft. No tops were reported. Placid Oil Co. 136 Louisiana Central Lumber Co., 15-10n-4e, was below 8,908 ft. in Lower Glen Rose. In Ouachita Parish, The California Co. 2 Breece Lumber, 30-17n-5e, was coring at 6,240 ft. A 20-minute test at 5,614-30 ft. recovered 1,000 ft. of water cushion and 2,000 ft. of salt water. In Webster Parish, Hunt Oil Co. 1 Haynesville Mercantile Co. 9-23n-9w, was below 10,820 ft. in sand and shale.

NORTH LOUISIANA WILDCAT FAILURES

Sabine Parish: R. L. Gay 1 Long Bell Lumber Co., 26-7n-14w, dry, TD 2,600 ft., no tops reported.

Tensas Parish: C. H. Osmond 1 Hogue, 21-13n-13e, dry, TD 7,524 ft., no tops reported.

Union Parish: Markham, River & Burt 1 Slade, 6-22n-1e, dry, TD 2,530 ft., Wilcox 1,139 ft., Midway 1,482 ft., Saratoga 2,342 ft., elev. 228 ft.

ARKANSAS WILDCAT FAILURE

Hempstead County: C. L. Wickcliffe 1 Ward, 33-9s-23w, dry, TD 1,803 ft., no tops reported.

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ROCKY MOUNTAIN

Activity Increases in Mush Creek Development

DENVER.—A lease play, described as "very hot," has developed along the western flank of the Blackhills uplift in northeastern Wyoming extending a distance of more than 75 miles in a general north-south direction and reaching far out into Powder River basin on the west, as a result of developments in Mush Creek field. Mush Creek, like the Osage field 15 miles to the northwest, received little attention from the major companies until about a month ago when Morton Drilling Co. 1 Sedgwick, C NE NE 17-44n-63w, which extended the pool 1½ miles to the west, came in flowing and swabbing as high as 259 bbl. per day at a total depth of 4,165 ft., from the Newcastle (Muddy) sand at 4,155 ft. Then the operator moved ¼ mile to the west and drilled 1 Johnson which made 1,740 bbl. the first 24 hours, the oil being around 42° gravity. The majors then took a look at the development, and discovered something which changed their opinion regarding a most interesting situation.

Osage field, discovered in 1920, has produced more than 4,000,000 bbl. of 37° to 40°-gravity oil from the Granerous shale and Newcastle sands at depths ranging from 200 to 4,500 ft. The oil is found in lenses of the Newcastle sand, the thickness and porosity of the sand varying, and some times as many as 4 or 5 lenses separated by impervious shale being encountered in a single well. The deeper tests failed to reveal anything of importance below the Newcastle, and the larger operators lost interest. The small operators then took over, and the development proceeded with cable tools, some being little more than water-well outfits. As the development proceeded toward the west, thicker and more porous sands were drilled, but there was practically no coring or correlating of logs, but results indicated a series of shore-line benches with best results at greater depth. Next came Mush Creek 3 years ago which has revealed similar conditions, with sand and quality of oil improving toward the west. Then came a development which to a large extent was overlooked until the situation demanded a more intense study.

Mush Creek key wells.—Phillips Petroleum Co. is completing a good producer in its 1 Weston, SW SE SE 8-44n-63w, a northeast offset to the Johnson 1,740-bbl. well. It topped the Newcastle at 4,138 ft., set 5½-in. at 4,139 ft., and drilled to 4,220 ft. When tubing was run and swabbing began, it flowed. No sustained test has been made at this writing, but it started off at an indicated rate of 30 bbl. per hour natural. Phillips 1 Torgeson, C NW SE 7-44-63, 1¼ miles northwest of the Johnson well, is bottomed at 4,335 ft., with 5½-in. at 4,254 ft. Rotary was moved out and it is being completed with cable tools. It is cleaning out at 4,280 ft., and will go to bottom before swabbing mud to clean the hole.

Madison lime pool extended.—The Madison lime proven area in Cut Bank field in Montana was extended 1,320 ft. to the south in Union Oil Co. 8 Langabeer Unit C, NE NW 7-35n-5w, which flowed 411 bbl. natural in 17 hours through a ⅜-in. choke. It had the top of the Madison at 3,071 ft. and at 3,089 ft., only 18 ft. into the formation, the tools were blown out of the hole and the well started flowing. The master gate valve was closed, and the well was then pinched in for the test. It is a south offset to 7 Langabeer unit.

East Antelope discovery.—Continental Oil Co.-General Petroleum Corp. 1 Unit, NW SW SE 26-27n-93w, East Antelope area, Fremont County, Wyoming, which has been plugging back from 6,611 ft., and testing upper horizons, set the 7-in. at 2,300 ft. Through 20 perforations at 2,157-80 ft., it flowed estimated 20,000,000 cu. ft. per day.

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Utah oil show.—Scouts are investigating a reported oil show in a wildcat located 5 miles south of the town of Cisco, Grand County, Utah, 12 miles west of the Colorado boundary, and 15 miles southeast of the old Cisco gas field. Information which so far appears to check correctly is that Taylor Brothers, who operate a grocery in Grand Junction, are drilling 1 State in 31-21s-24e on a block of 1,100 acres of state land, and at around 1,700 ft. encountered a show of light green oil in the top of the Ferron sand. Oil was reported standing 350 ft. in the hole when the operator shut down to obtain and run a string of casing. The Ferron sand, of upper Cretaceous age, which lies about 400 ft. above the Dakota, is the equivalent of the Frontier in Wyoming.

Utah wildcat plugging back.—Carter Oil Co. 1 Knudsen, C SW NE 18-5s-21e, West Vernal district, Uintah County, Utah, stopped drilling at 6,012 ft. and started plugging back to test upper shows. The 7-in. was set at 4,150 ft., and it is preparing to perforate at 4,058-82 ft. On the way down it recovered 12 ft. of core at 4,063-80 ft. of which 11 ft. was saturated with dark oil. Drill-stem test at 4,056-80 ft., open 30 minutes, recovered 240 ft. of gas-cut mud. Location is 5 miles southeast of Carter's 1 Davis, which was abandoned last spring at 8,001 ft. in the Mesa Verde.

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Elk Springs extension.—Continental Oil Co. 2 Smith, SW NW SE 30-5n-96w, Elk Springs area, Moffat County, Colorado, took drill-stem test at 6,190-6,277 ft., open 1 hour and 20 minutes. Gas to the surface in 45 minutes. Recovery was 800 ft. of 30°-gravity oil, and 600 ft. of oil-cut mud. Top of Weber, electric survey, was at 6,246 ft. The 7-in. is at 6,246 ft. Well ran 81 ft. higher on the Weber than the discovery, one-third of a mile to the southwest.

New operations.—Twenty-one operations were reported, of which 1 was in Colorado, in Rangely field, 6 were in Wyoming, 9 in Montana, 3 in northwest New Mexico, and 2 in Utah. Wyoming locations included 2 in Mush Creek, 1 in Steamboat Butte, Fremont County, and 3 wildcats. The latter include Iris Oil Co. 1 Government, C NW SW 8-64n-93w, Crystal Creek, Big Horn County, a 1,000-ft. test to the Tensleep on eastern rim of Big Horn basin. Pure Oil Co. 1 Unit, C Lot 9, Section 34-56½-69w, Rocky Point structure, Campbell County, unitized block, with Pure as unit operator. The third test is Stanolind Oil & Gas Co. 1 Tribal, C SW NW 30-2s-2e, Lander-Hudson field, Fremont County. It is an old well being deepened from 1,175 ft. to test the Madison. Montana operations include 3 in Cut Bank, 1 in Cedar Creek, 3 in Bowdoin shallow gas field, and 2 in Kevin-Sunburst. Northwest New Mexico locations were in Kutz Canon, to go to the Picture Cliff, and 2 wildcats. Florence Drilling Co. 1 Hudson federal, SW NW NW 10-26n-10w, El Huerfano district, first of 3 wells to be drilled for gas to 2,500 ft. Block consists of 24,000 acres adjoining Kutz Canon gas field on the south. Other wildcat is Florence Drilling Co. 1 Shaw, C SW SE 13-30n-9w, Blanco district, San Juan County, 3½ miles northeast of same company's Mansfield-Federal, completed last year. The most important Utah wildcat is Western Natural Gas Co., Byrd-Frost, Inc.-Paul B. English 1 Unit, C SW NE 21-43s-22e, Boundary Butte, San Juan County, a Weber sand test to 6,000 ft. Western Natural Gas was high bidder on an Indian lease on 4,080 acres for $67,728 2 month ago. Other Utah wildcat is Richfield Oil Co. of Montana 2 State, SW SW SW 36-5s-23e, Trail Creek, Uintah County, ½ mile west of 1 State, which was abandoned as junked hole at 250 ft.

Completions.—Twenty-one wells were completed, of which 14 were oil wells with initial production of 2,251 bbl., 1 gas well, and 6 were dry holes. Colorado had 7 completions, all oil wells, for 1,270 bbl. in the Rangely field. Wyoming had 7 completions, of which 3 were oil wells for 223 bbl., 4 were dry holes, the oil wells were 1 in Hamilton and 2 in Oregon Basin fields, 1 dry hole at Spence, and 3 wildcats. Montana completions were 4 oil wells for 758 bbl., 1 gas well and 1 dry hole, no wildcats. The gas well was in Cedar Creek field. Cut Bank had 3 oil wells and Kevin-Sunburst had 1 oil well and 1 dry hole. Northwest New Mexico had one dry hole in a wildcat.

WYOMING WILDCAT FAILURES

South Elk Basin, Park County: Husky Ref. Co. 2 Taggart, C SE NE 13-56n-100w, TD 7,347 ft., temporarily abd., top of Frontier 6,863 ft., elev. 5,057 gr., 2,000 ft. lower than nearest South Elk Basin well.

Hidden Dome, Washakie County: Mackinnie Oil & Drilling Co. 1-B Broome, NE SE NE 6-47n-90w, TD 5,515 ft., P. & A., Tensleep 4,865, Madison 5,300, elev. 4,529 KB, water in Tensleep and Madison, 1 mile south of Tensleep discovery.

Skull Creek, Weston County: J. G. Ladmer 1 Marker, SW SW SW 17-44n-62w, TD 3,495 ft., P. & A., sand 3,324-3,358 ft.

NORTHWEST NEW MEXICO WILDCAT FAILURE

Meadows, San Juan County: British-American Oil Prod. Co. 1 Cronican-Federal, NE NE SW 23-30n-16w, TD 5,953 ft. P. & A., tight hole, reported to have topped Dakota at around 4,100 ft., and to have drilled through a fault.

MISSISSIPPI

Tests Continued on Franklin County Well

JACKSON.—In the Oldenburg area, J. C. Hawkins 1 Lehmann, Section 27-7n-2e, Franklin County, has been squeezed following an increasing show of salt water on production test. During the past week the 7-in. casing has been drilled out and hole cleaned to 10,673 ft. after which 96 ft. of 5½-in. Securaloy liner was cemented, bottomed at 10,615 ft. Liner was perforated from 10,653-64 ft. and 10,610-11 ft. for squeeze cement job with retrievable packer set at 10,513 ft. in the 7-in. casing.

Following a dry test of the squeeze job, liner was perforated from 10,550-52 ft. and Halliburton drill-stem test taken with packer set at 10,498 ft. Opened on ¼-in. choke at top, ¼-in. on bottom, the 3,640-ft. water cushion hit top in 26 minutes, and after flowing back the water cushion and initial mud and sand, the well flowed pipe-line oil for approximately 2½ hours. At end of that time first evidence of salt water was noted. Tested in tank through 5/32-in. top choke for 4 hours and 25 minutes, flowing at the rate of 14.5 bbl. of fluid per hour; salt water occurred in intermittent heads, reaching a maximum of 15 per cent. Operators changed to 9/64-in. top choke and the well flowed at the rate of 9.25 bbl. of fluid per hour for 4 hours; oil was clean during first 2 hours, then made salt water as on the previous test.

The test continued for 8 hours and 45 minutes, with salt water percentage increasing to an average of 40 per cent. Halliburton retrievable packer was set at 10,513 ft. and total of 145 sacks of cement were squeezed out with final pressure of 5,000 psi. Operators will make drill-stem test on the same interval 10,550-52 ft., without reperforating.

At Ovett, Jones County, Gulf Refining Co. 1 L. L. Majors, 29-6n-11w, is now perforating 12,152-78 ft., and 12,208-32 ft. for further testing. Tests following the acidization of perforations at 12,537-60 ft. flowed at the rate of 4 bbl. per hour through a ¼-in. top choke; however, the flow rate and pressures were declining at end of test. Drill-stem test through perforations at 12,270-88 ft. recovered 1,590 ft. of mud, the upper 1,260 ft. of which was cut with gas and had slight show of oil.

There were 12 new locations reported this week, 3 being wildcat starts, 2 in Humphreys and 1 in Madison County. Field locations were Baxterville, Lamar County, 2; Brookhaven in Lincoln County, 1; Heidelberg-East, 1; Heidelberg-Graben, 3; Heidelberg-West, 1; and Pickens, in Yazoo County, 1.

MISSISSIPPI WILDCAT FAILURE

Madison County: Tip Ray et al 1 Louis Collier, C NW SW 7-11n-4e, dry, TD

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ALABAMA WILDCAT FAILURES

Choctaw County: H. L. Hunt 6 Robert T. Land, C NE SE 24-11n-5w, dry, TD 5,747 ft.

Escambia County: H. L. Hunt 6 T. R. Miller Mills Co., NW SE 7-2n-11e, dry, TD 7,551 ft.

Pike County: R. G. Hauser 1 G. C. Chancellor, 7-11n-22e, dry, TD 1,332 ft.

CALIFORNIA

Activity Increases In Signal Hill Play

LOS ANGELES.—Activity at Signal Hill, stimulated by Shell Oil Co., Inc., recent deep-zone discovery there, is showing a steady increase with Hancock Oil Co. being the latest to enter the play. It was reported during the past week that Hancock has successfully leased the Virginia Country Club of Long Beach, which for the last several weeks has been the scene of leasing activity by several companies. According to the reports, Hancock paid a bonus of $125,000 plus a royalty of 25 per cent for the club acreage.

Currently prevailing thought among the geologists in the area is that the new deep zone may be productive along the entire north flank of Signal Hill, although the productive status of the zone is not now quite as sure as was originally thought. Shell's discovery well, the 2 Dolley, which was originally completed for a flow of more than 500 bbl. daily, currently is producing between 275 and 300 bbl. daily and is cutting approximately 57 per cent water. Pressures, which were extremely high originally, have now declined to 1,700 psi. on the tubing and 2,300 psi. on the casing. It is believed by those familiar with the area that the trouble can be cleared up in subsequent wells, but confirmation of this theory will have to await completion of wells now drilling.

Wells currently headed for the new zone include one well being drilled by Shell and one by General Petroleum Corp. In addition, Shell has staked location for two more, Pacific Western Oil Corp. for one, and Signal Oil & Gas Co. for one.

Current reports from Basin Oil Co. 2-1 Inglewood Community, 28-2s-14w, confirmation test in the Inglewood area of Los Angeles County, state that the well is coring ahead below 9,800 ft. with an excellent-appearing oil sand topped at 9,549 ft. The oil sand in this well apparently is very similar in appearance to that found in the first two wells in the area, but is structurally higher. The two original wells currently are producing in excess of 400 bbl. daily along with a considerable quantity of gas. The discovery well has been on production for more than a year and is still making approximately the same amount of oil as when completed. The second well has been on production for only a few weeks, but production is holding up to the original gage. The extremely small production decline in these two wells has been a source of surprise to many people and it is now believed that the new field may develop into a much larger reservoir than was originally thought.

Danciger Oil & Refining Co., Tulsa, in conjunction with Terminal Drilling Co., Gilliland & Lyte Oil Co., and J. D. and W. E. Sievers, has staked location for a new wildcat venture in Section 34-32s-15e of San Luis Obispo County. Known as the 1 Twitchell, the well is located near many important oil seepages. Geology for location of the well is said to be based upon the tracing of Guyama Valley outcrops toward the coast.

New locations staked in California took a decided jump during the past week with 58 new ventures announced. This is an increase of 10 over the total for the previous week. Principal cause of the increase was 15 new locations staked in Wilmington field, 12 of which were staked by Union Pacific Railroad Co. Other fields in line for several new wells are Huntington Beach with four new locations, Long Beach, Kern Front and Ventura Avenue with three each, and Ramona, Edison, Kern River and Lost Hills with two each.

California completions also showed a slight increase during the past week with 45 wells finaled as compared to 40 for the previous week. In addition to the 9 wildcats, 36 field wells were completed, including 1 dry hole at Paloma and 1 gas well at Trico. Most active fields during the week were Wilmington with eight new oil wells, Huntington Beach with five, Kern River with three and Lost Hills with four.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, Ten Section Area: Shell Oil Co., Inc., 53-30 KCL-A, 30-30s-26e, flowed 452 bbl. in 16 hours, 35.9° gravity, 30.0 per cent cut, 550,000 cu. ft. gas, perf. 8,820-60 ft. in lower Stephens, tubing pressure 80 psi., casing pressure 1,225 psi., TD 14,000 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Blackwells Corner Area: Hamilton and Sherman 3 Beer "B," 7-26s-19e, dry in brown shale, elev. 700 ft., top Oceanic equivalent 822 ft., TD 1,003 ft.

Edison Area: Gene Reid Exploration Co. 1 Josephine, 33-30s-30e, dry in Granite, top basement 340 ft., TD 414 ft.

El Paso Creek Area: Western Gulf Oil Co. 1 Tejon Ranch, 29-11n-18w, dry, elev. 803 ft., TD 4,231 ft.

Fruitvale Area: Superior Oil Co. & Independent Exploration Co. 57-13 KCL-A, 13-29s-27e, dry, elev. 378 ft., TD 8,232 ft.

Jasmine Area: E. B. Hall 1 C. H. Hubbard, 34-25s-27e, dry, elev. 704 ft., TD 1,890 ft.

Temblor Area: Miller & York 1 F. O. B., 31-29s-21e, dry, went through fault at 1,069 ft., TD 2,000 ft.

Monterey County, San Ardo Area: The Texas Co. 1 Giaggi, 12-22s-9e, dry, elev. 615 ft., TD 1,805 ft.

Ventura County, Simi Area: Union Oil Co. 1 Corehole-C. D. L. B., 32-3n-18w, dry, TD 1,065 ft.

APPALACHIAN FIELD

3 E. G. Walker Shows For 30 Bbl. Daily

PITTSBURGH.—In Young pool, North Strabane Township, Washington County, southwest Pennsylvania, Charles E. Young completed 3 E. G. Walker in the Gantz sand at 2,157 ft. which is showing for 30 bbl. a day. The Gordon below is untested.

In Wayne Township, Erie County, northwest Pennsylvania, the wildcat of Pennsylvania Gas Co. on the John Kalika farm which had a showing of 20,000 cu. ft. of gas from the White Medina (4,547-53 ft.) natural, was shot with an increase to only 26,000 cu. ft. and a rock pressure of 948 psi. in 7 days. It is being plugged.

In Ravenswood district, Jackson County, West Virginia, Columbian Carbon Co. topped the Corniferous lime at 4,483 ft. in the wildcat 958 C. D. Eickelberry from a surface elevation of 647 ft. and ran 7-in. at 4,507 ft. In Ripley district, United Fuel Gas Co. topped the Corniferous lime at 4,673 ft. in the wildcat on the L. E. Wetzell farm from a surface elevation of 715 ft.

In Elk district, Kanawha County, United Fuel Gas Co. topped the Corniferous at 5,400 ft. from a surface elevation of 1,035 ft. in the test, 5,839 W. A. MacCorkle.

New locations in West Virginia totaled 11 and were in Washington district, Boone County; Birch district, Braxton County; Lee district, Calhoun County; DeKalb district, Gilmer County; Cabin Creek district, Kanawha County; Harts Creek district, Lincoln County; Teays Valley district, Putnam County; and Oceana district, Wyoming County.

WEST VIRGINIA SUCCESSFUL WILDCATS

Braxton County: Otter district: Morris Oil & Gas Co. 1 S. P. Hosey, 323,000 cu. ft. gas, Salt sand, TD 1,663 ft.

Wayne County, Lincoln district: Virginian Gasoline & Oil Co. 6,179 H. J. Stark, 11½ bbl., Maxton sand, TD 1,350 ft.

Union district: Chartiers Oil Co. 1 Sarah Schrecengost, 15 bbl., Berea, TD 2,068 ft.

WEST VIRGINIA WILDCAT FAILURE

Braxton County: Birch district: W. H. Satterfield 1 J. W. Carr, dry, Injun sand, TD 2,250 ft.

OHIO, KENTUCKY

Polk Pool Widened by 1,160,000-Cu. Ft. Well

COLUMBUS.—G. B. Harmon et al widened the new Polk pool ¼ mile to the west by a 1,160,000-cu. ft. well on Effie Sprinkle et al, Section 18, Jackson Township, Ashland County. Clinton sand was reported at 2,880-90 ft.; total depth was 2,902 ft.

In the southwest part of Hemlock Grove pool Preston Oil Co. 1 George Heines, Section 2, Bedford Township, Meigs County, found good sand at 1,607-29 ft. with a nice showing of oil. After a 60-qt. shot, the well flowed 73 bbl. with 100,000 cu. ft of gas.

Roy Weed et al 3 Cleveland Trust Co., Lot 18, Aurora Township, Portage County, found the Red Clinton at 3,940-4,007 ft. with gas shows at 3,980 ft. and 4,002 ft., and an oil show at 4,006 ft. The white sand at 4,007-21 ft. was dry. The well has been shot and is reported as making 300,000 cu. ft. gas and some oil.

In Sayre pool Fred Beasley et al 4 Martha Reed, Section 23, Bearfield Township, Perry County, reached the Clinton at 3,893 ft. and at 25 ft. in had 800,000 cu. ft. gas. The well is temporarily shut down on account of casing trouble.

Pittsburgh O. & G. is attempting to drill past stuck tool at 5,189 ft. in its wildcat on Lewis Larrick in Section 20, Brookfield Township, Noble County.

Thirty locations were reported for the week and were scattered over 14 counties. Monroe led with 6 and Perry and Washington had 3 each. Ashland and Brush Creek fields each had 6 completions out of 29 for the week.

OHIO WILDCAT FAILURES

Gallia County, Greenfield Township: Commonwealth Gas Corp. 1 W. A. Murdock, Sec. 31, Clinton 3,073-81 ft., Medina 3,170-3,220 ft., TD 3,242 ft.

Summit County, Northampton Township: Wiser Oil Co. 1 E. C. Bender, Lot 83, Clinton 3,272-3,381 ft., TD 3,406 ft.

EASTERN KENTUCKY

ASHLAND.—Pike County accounted for the week's completions, all by Kentucky-West Virginia Gas Co. Well No. 869, J. C. Mullins property, had 103,000 cu. ft. gas in shale A. S.; total depth was 3,075 ft. Well No. 5,696, Neal Roberts property, was completed in salt sand for 1,050,000 cu. ft. gas with a total depth of 1,333 ft. Well No. 5,728, J. S. Cline property, produced 207,000 cu. ft. gas from shale and Big lime, and was bottomed at 3,716 ft.

WESTERN KENTUCKY

OWENSBORO.—O. O. Borden et al 2 Whitfield, 1-K-25, a wildcat 2½ miles east of Hanson and 6 miles northeast of Madisonville, Hopkins County, has hit Tar Springs sand pay. After 40 qt. shot at 2,296-2,325 ft., the test swabbed 8-10 bbl. oil per hour.

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Same operator's 3 Whitfield found Tar Springs sand tight. However, drill-stem test of Pennsylvania gas sand at 1,344-60 ft. gaged about 1,500 M.c.f. gas. These wells are about 10 miles from other commercial production.

In Logan County, 80 miles south of Evansville, Ind., the F. W. Mitchell 1 Logsdon, 21-G-31, flowed 5 bbl. of oil per hour from McClosky lime at 584-89 ft. after 1,000 gal. acid. Total depth is 894 ft. in this shallow pool opener. The well is 15 miles from other production and near the town of Lewisburg.

INDIANA

EVANSVILLE—Indiana wildcatting is currently heavy in Sullivan County where four tests are now under way. W. R. Kuykendall 1 Jamison, NW NW SE 31-8n-9w, is drilling below 2,364 ft. Charles Lowery 1 McGrew, E½ SE SW 1-8n-10w, is drilling below 1,918 ft. Robert Clark 1 Enos Brothers, NW NW NW 9-8n-10w, is shut down at 385 ft. and Dittman-Ormiston have staked location for 2 Campbell, NW SE SE 16-8n-10w.

MICHIGAN

New Michigan Discovery Seen in Newaygo County

SAGINAW—A gas and oil show in a wildcat well being drilled 12 miles northwest of the big Kimball Lake oil field in Newaygo County October 9 raised the possibility of another Michigan discovery.

The operation in Section 10 of Denver Township, Newaygo County, is reported financed by unnamed Muskegon interests and one major oil company under a permit to E. L. Bourret. The show was reported from Traverse limestone and resulted in a halt in operations pending storage facilities and drilling into the hoped-for pay.

Other Michigan activities for the week resulted in 24 completions for eight oil wells, two gas wells, and 14 dry holes, of which seven were wildcats. Producers included two more in Kimball Lake field which now contains more than 70 wells. The initial potential from these two completions was 2,740 bbl. Potential totaled 115 bbl. from the four producers completed in Bay County. A potential of 8 bbl. was reported for an Ottawa County completion, 50 bbl. for the other in Van Buren County. The gas wells are in Clare County.

Four of the 14 new locations are for gas wells in Clare County. Other new locations: Two each in Bay and Van Buren; one each in Arenac, Lake, Clinton, St. Clair, Montcalm, and Newaygo.

MICHIGAN WILDCAT FAILURES

Allegan County, Heath Township: W. E. Wyse 1 Fred Eding, NW NW SE 5-3n-14w, dry in Traverse limestone, TD 1,535 ft.

Isabella County, Lincon Township: Union Development Co. 1 Anna B. Cole, SE NE SE 16-13n-4w, dry in Detroit River, TD 3,655 ft.

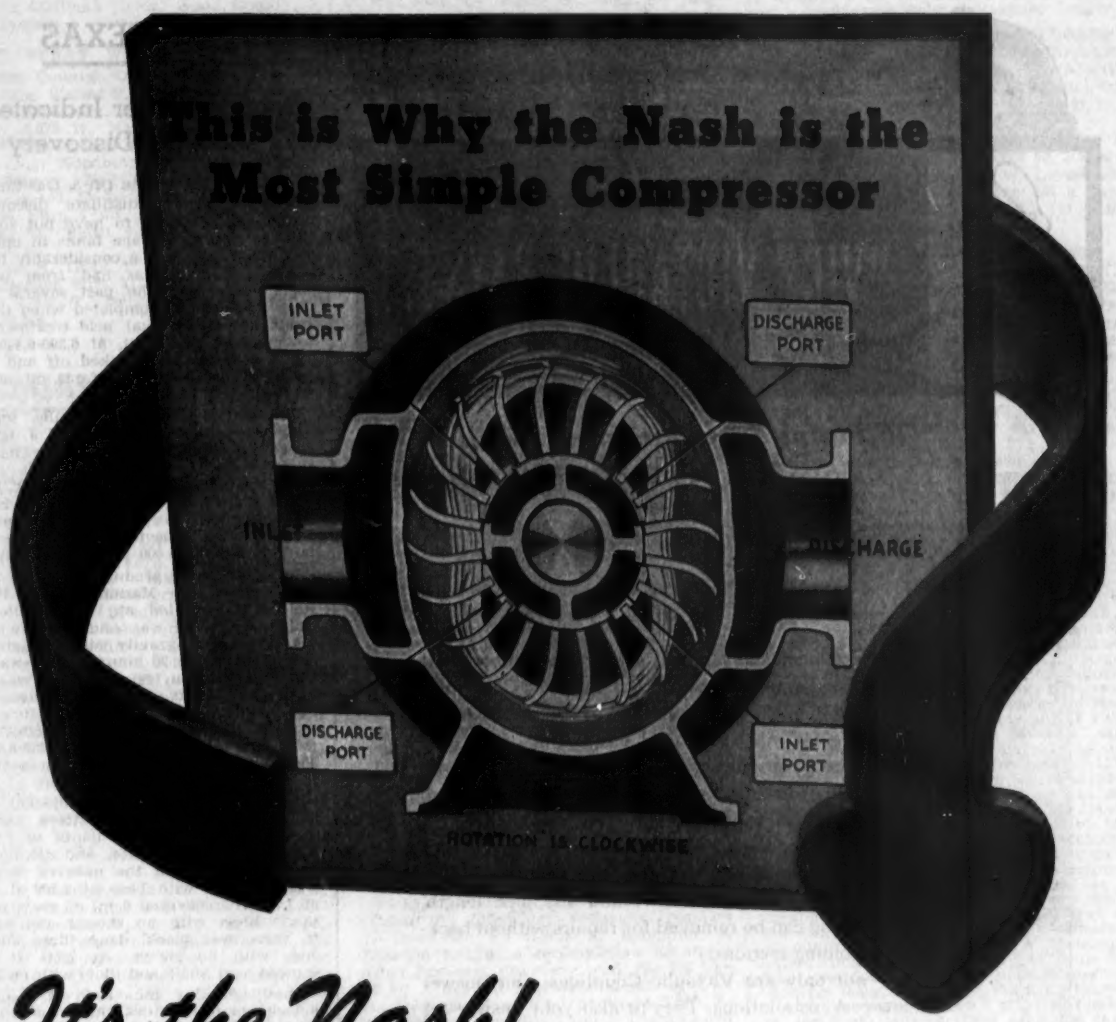
Muskegon County, Casnovia Township: Cities Service Oil Co. 1 Harry Lautenschleger, NW NW SE 8-10n-13w, dry in Detroit River, TD 2,692 ft.

Montague Township: Eugene Hilliard 1 Reinhild K. Christensen, SW SW SE 1-12n-17w, dry in Traverse limestone, TD 1,850 ft.

Newaygo County, Goodwell Township: Taggart Brothers Gas Co. 5 Alger-State, C-SW 23-14n-11w, dry, TD 1,197 ft.

Lincoln Township: Sun Oil Co. 1 John M. Bryg, NE NW NE 18-14n-13w, dry in Detroit River, TD 2,855 ft.

Oceana County, Colfax Township: Superior Oil Co. 1 Blamer-Colfax communitized, NW NW NE 33-16n-15w, dry in Sylvania, TD 3,358 ft.



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EASTERN TEXAS

Good Producer Indicated For Distillate Discovery

DALLAS.—Stanolind Oil & Gas Co.'s Harrison County distillate discovery, 1 Slaughter, was said to have put some 500 bbl. of oil into storage tanks in one night last week, giving it a considerably brighter outlook than it has had from previous tests made over the past several weeks. The well may be completed when it cleans itself from a 5,000-gal. acid treatment. Following this treatment, at 6,390-6,440 ft. in the Pettit, the well kicked off and flowed an unestimated amount of gas, oil, and acid water.

In Denton County, 5½ miles southeast of Pilot Point, The Texas Co. 1 J. R. Rotan cored an unidentified limestone having a slight show of oil at 3,496-3,533 ft. A drill-stem test between 3,500-33 ft., open 1 hour, recovered 15 ft. of drilling mud. Bottom-hole pressure was 210 psi. in 20 minutes. The test was expected to be in the Ellenburger around 4,000 ft., contract depth.

First Pettit oil production in the Jefferson end of the Marion County Rodessa field was reported at Paul H. Pewitt 1 Ralph. The well was said to have flowed 470 bbl. of 45°-gravity oil, through ⅝-in. tubing choke, in 20 hours on a Texas Railroad Commission test. This test was deepened to 6,454 ft. from the Rodessa zone but had been shut in for some time when it showed water. The new production is from perforations between 6,432-6,454 ft. Two small gas wells have been completed in the Pettit zone previously.

In Freestone County, Humble Oil & Refining Co. 1 R. P. McWatters, south of Freestone, was at total depth of 7,797 ft. in shale and anhydrite, and taking sidewall cores. Top of the massive anhydrite was 7,489 ft., with base at 7,590 ft. Cores at 7,734 ft. recovered 6 in. of gray, porous, sandy lime, with no shows; and at 7,701 ft. there was black, dense lime and calcite, with no shows. At 7,744 ft. cores showed ashy shale and lime, with no shows.

Shell Oil Co., Inc. 1 F. E. Lumpkin, Smackover test 4 miles southwest of Cedarville in Kaufman County, cored lime and shale at 4,850 ft. Electric log tops reported were: Pecan Gap 1,767 ft., Austin 2,477-3,058 ft., sub-Clarksville 3,087 ft., Woodbine 3,534 ft., and Comanchean lime 4,246 ft. Operators were drilling below 4,644 ft.

In Smith County, 2 miles north of Mount Sylvan, Magnolia Petroleum Co. 1 R. W. Fair had total depth at 6,250 ft. in limestone and shale, and was waiting on cement after setting casing to 6,246 ft. Sample tops reported were: Woodbine 5,220 ft., red beds 5,340 ft.

M. E. Davis et al 1 Temple Lumber Co., 6 miles east of Geneva, in Sabine County, had cored no shows to 7,491 ft., then drilled out to 7,510 ft. West of the Trinidad townsite in Henderson County, Ralph E. Fair, Inc., 1 T. T. Bradley cored shale and sand at 6,077 ft. Sample top on the Paluxy was 5,670-80 ft.

In Titus County, Byars, Peveto et al 1 Federal Land Bank was preparing to test a broken sand with oil shows from 4,232-39 ft. Operators plugged back from 4,352 ft. to 4,308 ft. and set casing to 4,231 ft. It is a south outpost location to Talco field.

In Cass County, west of Bloomburg, Shell Oil Co., Inc. 1 Gerald Smith topped Blossom sand at 3,405 ft., Woodbine at 3,540 ft., and on last report was drilling below 2,582 ft.

New locations staked last week totaled 12, including 2 for Freestone County; 2 wildcats in Henderson County; 1 field well in Hopkins County, and 7 starts for Wood County. Norman Paul field of Wood County continues active with 3 new locations.

Field completions for the week were: Whelan field, Harrison County, 1 gas well; Jefferson field, Marion County, 1 oil; Bethany field, Panola County, 1 gas well; Meri-

gale and Quitman fields, Wood County, 2 oil wells each.

EAST TEXAS WILDCAT FAILURES

Anderson County: O. W. Killam 1 J. M. McKee, Walter F. Poole Sur., 4 mi. SE Frankston, dry, TD 5,891 ft., base Midway 3,075 ft., Navarro chalk 3,195 ft., Pecan 3,960 ft., Austin 5,130 ft., by electric log; Woodbine 5,685 ft. by samples.

Falls County: Dail Goodson and J. W. Myers 1 J. C. Barganier, Gregoria Basquez Sur., 4 mi. NW Regan, dry, TD 4,487 ft., Pettit 4,188 ft., Travis Peak 4,326 ft.

Roland R. Gray 1 Lucy Taylor, J. A. Manchaca Sur., 2¼ mi. E Chilton, dry, TD 1,202 ft., Georgetown 1,175 ft. by samples.

PERMIAN BASIN

Water Table Established in Gulf's 439-E Goldsmith

MIDLAND.—Gulf Oil Corp. apparently has established the water table and the end of Clear Fork pay in its 439-E Goldsmith, ⅜-mile northwest outpost to the Goldsmith Ellenburger discovery in Ector County. A 90-minute drill-stem test at 5,685-5,735 ft. recovered 90 ft. of mud and 270 ft. of sulfur water. Operators were to make another test before deepening to the Ellenburger. Gulf's other test, the 437 Goldsmith, which has shown oil production in the Clear Fork at approximately the same depth as the 439, and which is also being watched with considerable interest, recovered 350 ft. of mud, with no oil, on a test of the Tubb zone at 6,400-50 ft. Operators deepened to 6,492 ft. and prepared to make another test. Location of the 437 Goldsmith is 2 miles south and slightly west of the 439, and in Section 28, Block 44, T&P Survey.

End of Pennsylvanian pay was apparently determined at Stanolind Oil & Gas Co. 1 Hall, south-central Cochran County deep test, which recovered water blanket and 45 ft. of drilling mud in a 1-hour test at 10,484-10,546 ft. Operators then continued drilling. Previously, the well flowed at an estimated rate of 20 bbl. of oil an hour during a drill-stem test at 10,401-483 ft. Location is 15 miles south of Lehman and near a few San Andres producers from around 5,100 ft.

Lion Oil Co. 1 G. H. Cowden, Section 14, Block X, CCSD&RGNG Survey, southeastern Crane County Devonian prospect, was to run casing for completion tests. A 3-hour drill-stem test at 8,498-8,575 ft. blew air immediately, with gas coming to the surface in 2 hours and 45 minutes. Total recovery was 250 ft. of gas-cut mud and some 700 ft. of salt water. A test from 8,382-8,500 ft. recovered 1,800 ft. of oil-cut drilling mud, 250 ft. of clean oil, and 450 ft. of black, heavily oil and gas-cut mud. It was said the latter test might be producing oil from the Silurian, in which case it would be running high on that structure since Humble Oil & Refining Co. 1-B Cowden, ¾ mile to the south, placed top of the Silurian at 8,730 ft.

In the northeast Gaines County area of Adair field, which extends across the Terry County line, Paul F. Rutledge 1 Bice was expected to extend production 1 mile to the southeast. Operators set casing on bottom at 4,900 ft., and ran electric log. The well had shown streaks having possible production in the San Andres.

In southeastern Upton County, Slick-Urschell Oil Co. 1 D. L. Alford took a drill-stem test in the Ellenburger at 11,025-95 ft. Gas came to the surface at the end of 3 hours, at an estimated rate of 50 000 cu. ft. daily. Total discovery, after tool was open 4 hours and 50 minutes, was the 800-ft. water blanket and 150 ft. of gas-cut mud. On last report operators were near 11,145 ft., where they planned to make another test.

Plymouth Oil Co. 1 Georgia Frost, Section 39, Block 2, H&TC Survey, Sterling County Ellenburger test 11½ miles northwest of Sterling City, was reported to have some increase in the oil content of fluid being swabbed from perforations at 8,358-63 ft. Recovery was running some 6½ bbl. of fluid an hour, being about half oil and half water.

The 2-mile west extension area to Levelland field of Hockley County, which has had an extensive drilling play this year, received a second prolific producer when James Fitzgerald, Jr., of Midland, 2 W. T. Coble rated a daily flowing potential of 533 bbl. of oil, through ¾-in. choke. Total depth was 4,816 ft., with casing set to 4,774 ft., and the interval acidized with 8,000 gal. Gas-oil ratio was 485:1.

In Dollarhide field of Andrews County, Lion Oil Co. 1-B Tennie Cowden, Section 6, Block A-55, PSL Survey, was completed as a west extension flowing 261 bbl. of oil a day through ½-in. choke on tubing set to 8,400 ft. Top of pay was 3,314 ft., on an elevation of 3,155 ft., and total depth was 8,524 ft., plugged back to 8,425 ft.

Field oil-well completions last week included the following: Fullerton (regular) 5; three-Bar 1; Means 1; Slaughter 3; Jameson 2, plus a recompletion on the 1 Allen Jameson, discovery well, for 275 bbl. of oil a day, at new total depth of 6,407 ft., from previous total depth of 6,245 ft.; Waddell 1; Sand Hills Tubb 3; Clara Couch 1; Toborg 4; Welch 2 recompletions; Foster 1; Andector 1; TXL Devonian 1; TXL Ellenburger 1; Levelland 3; Howard-Glasscock 1; Pecos Valley High Gravity 2; Sharon Ridge 3; Adair 2; Crockett 1; Shipley 1; Keystone Colby 1; Keystone Ellenburger 1; and Keystone Devonian 1.

New locations for the week totaled 50, compared with 32 the previous week. These were, by counties: Andrews 6, including 3 for Fullerton Devonian, Fuhrman 1 and Three-Bar 1; Crane 10; Dawson 2; Ector 6; Hockley 18, of which Levelland received 15, Slaughter 2, and 1 wildcat; Pecos 2, being 1 wildcat and 1 for Crockett; Ward 2; Winkler 2 for Keystone Devonian field; and 1 for Wasson field of Yoakum County.

WEST TEXAS SUCCESSFUL WILDCATS

Crockett County: Gar-Ter Drilling Corp. 1-S Weiner-Vaughn, Sec. 86, Blk. OP, GC&SF Sur., 6½ mi. E Todd Deep field, pumped 216 bbl. 19°-gravity oil, pay 1,500-01 ft., TD, elev. 2,808 ft.

Hockley County: James Fitzgerald, Jr., 1 W. T. Coble, Subd. 46, Lodge 69, Hardeman CSL Sur., 6 mi. W Levelland, flowed 486 bbl. 31.9°-gravity oil a day, GOR 452:1, top pay 4,785 ft., TD 4,830 ft., casing pressure 610 lb.

WEST TEXAS WILDCAT FAILURES

Crane County: Gulf Oil Corp. 1 T. C. Barnsley Estate, Sec. 41, Blk. 32, PSL Sur., 3½ mi. S of Sand Hills field, dry, TD 8,565 ft., Yates 1,740 ft., Grayburg 2,640 ft., San Andres 2,880 ft., Devonian 6,040 ft., Silurian 6,825 ft., Ellenburger 8,415 ft., elev. 2,500 ft.

Garza County: Tobe Foster 1 Connell, Sec. 103, Blk. 5, GH&H Sur., 13½ mi. E Post, dry, TD 4,205 ft., top limestone 1,800 ft., elev. 2,418 ft.

Howard County: Phillips Petroleum Co. 1 Viv, Sec. 23, Blk. 134, T&StL Sur., 20 mi. SE Fort Stockton, dry, TD 3,810

LEGAL

Bureau of Land Management, Washington, D. C. Notice is hereby given that sealed bids will be received until 1 p.m., Wednesday, **November 19, 1947**, for the SE¼SE¼ sec. 10, T. 28 S., R. 28 E., M.D.M., 40 acres, situated within the known geologic structure of the Mon Bluff Field, California. This land is offered to qualified bidders of the highest cash amount per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act of February 25, 1920 (41 Stat. 437, 30 U.S.C. sec. 181) as amended. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16⅔ per cent for gas, in accordance with Schedule B in the lease form. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., and each bidder must submit with the bid one-fifth of the amount bid in cash, or by money order, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.42(b) and (c). The envelopes should be plainly marked, "Bid for lease, Mon Bluff Field, California. Not to be opened before 1 p.m., **November 19, 1947.**" No bids received after the hour fixed herein for submitting bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a corporate surety bond in the sum of $1.000 must be furnished by a successful bidder prior to the issuance of a lease. A $5.000 corporate surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bid. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

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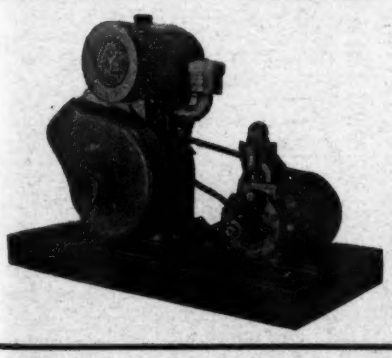

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ft., Yates 1,720 ft., Grayburg 2,170 ft. with dead oil stains, elev. 3,505 ft.

Runnels County: Pan American Producing Co. 1 M. H. Willis, G. W. Denton Sur. 468, NE cor. of county, dry, TD 4,262 ft., Palo Pinto 3,220 ft., Gray sand 3,989 ft., Caddo 4,147 ft., by samples, elev. 1,919 ft.

Scurry County: John Odstrcil 1 C. J. Harrell, Sec. 80, Blk. 3, H&GN Sur., 5½ mi. NE Snyder, dry, TD 3,800 ft., top limestone 1,426 ft., elev. 2,374 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Magnolia Petroleum Co. 1-A Santa Fe-Pacific, 33-10s-36e, was preparing to test at 5,230-5,506 ft. Amerada Petroleum Corp. 5 Phillips 1-20s-36e, Ellenburger test in the Monument field, Lea County, was drilling in unidentified limestone below 9,475 ft. Continental Oil Co. 1 Lankford, 2-14s-26e, 1½ miles northeast of Hagerman, south central Chaves County, recovered mud with no shows on a drill-stem test at 6,690-6,775 ft. in the Pennsylvanian. Operators were to plug back to 5,360 ft. to retest the Wolfcamp. Between the Russell and Artesia fields, north central Eddy County, Continental Oil Co. 1-A-24 State, 24-19s-28e, was plugged back to 2,726 ft., from 3,715 ft. Operators were to set 5½-in. casing to 2,500 ft. to test the San Andres.

Three new wildcats were reported scheduled for Eddy County. Magnolia Petroleum Co. will drill its 1-W State in 16-21s-22e, to 7,500 ft. Location is some 27 miles west and slightly north of Carlsbad.

Eight miles northwest of Carlsbad, Ralph A. Shugart will drill the 1 Superior-Federal, 26-21s-25e, to 2,500 ft. Sam Sanders will drill the 1 Edith Riggs-Federal, a shallow test in 3-21s-24e, about 15 miles northwest of Carlsbad.

N. CENTRAL TEXAS

Second Test in New Sherman Field Coring

WICHITA FALLS.—The second test for the new Sherman field of Grayson County was coring ahead toward the Strawn objective when it indicated production from a shallower sand. Standard Oil Co. of Texas 1 H. L. Rising, J. B. M. McNair Survey, cored 5 ft. of oil-stained sand at 2,922-27 ft., but a drill-stem test between 2,912-27 ft., open 1 hour, recovered 120 ft. of muddy and salty water. Cores at 3,148-56 ft. recovered 8 ft. of sand with a stain of oil, and at 3,224-30 ft. the recovery showed 6 ft. of sand showing oil. A drill-stem test between 3,223-30 ft. brought gas to the surface in 18 minutes but did not flow oil. Total recovery, after being open 1 hour, was 785 ft. of oil. Bottom-hole pressure rose to 1,165 psi. in 20 minutes. Operators shut down for orders. Contract depth was to 3,800 ft., or to the Strawn pay.

In Jones County, 2½ miles northeast of Hawley, J. C. Hunter, Jr. 2 Josie Shanks, Section 13, R. Smith Survey 192, was indicating a second pay zone for the new field in the King sand. Oil was said to have filled the hole with 900 ft. of oil, from shows found at 2,320-27 ft. A fair amount of gas was showing along with the oil. Operators set casing in preparation for completion tests. The location is an offset to the 1 Shanks, discovery well in the Swastika, and which had only a light show of oil in the King sand.

In Shackelford County, Fox & Fox 1 Dane Griffis, 3 miles east of Albany and a south outpost to Sanders field, was running a drill-stem test on shows of oil found in the Mississippian limestone around 4,430 ft. Outcome of the test had not been reported. Seven miles west of Albany, Danciger Oil & Refining Co. 1 Merrick Davis, Section 13, Block 12, T&P Survey, was drilling ahead below 3,295 ft. A scheduled Ellenburger wildcat, 11 miles west of Albany, F. Craig Morton 1 L. G. Davis, Section 40, Block 12, T&P Survey, was below 3,000 ft. with cable tools.

In Montague County, about 3 miles northwest of Denver, Continental Oil Co. 1 J. B. Williams estate had total depth at 7,386 ft. in limestone and was taking electric log after completing a series of drill-stem tests. A test at 7,218-31 ft. failed, and it was drilled out to 7,237 ft. where a test between 7,218-37 ft., open 1 hour, recovered 30 ft. of drilling fluid having a slight show of oil. Soft limestone was drilled between 7,299-7,318 ft., and a test of that interval, open 1 hour, recovered 30 ft. of drilling mud. Tops reported were: Caddo 6,040 ft., Barnett 6,313 ft., Viola limestone 6,693 ft., Ellenburger 7,218 ft. Elevation is 1,006 ft.

Continental 1 Hawkins, 2 miles east and 1½ miles south of Ringgold, Montague County, found sandy conglomerate having a slight show of oil at 5,785-95 ft. A drill-stem test at 5,784-93 ft., open 1 hour, recovered 15 ft. of drilling mud with no oil. Total depth is 5,867 ft. Operators then set 7-in. casing to 5,797 ft. and were swabbing from perforations at 5,752-57 ft., in the Ellenburger topped at 5,808 ft.

In the new area 3 miles south and east of Throckmorton, Throckmorton County, J. H. Snowden's 2 Howsley made 3 drill-stem tests, each flowing an unestimated amount of oil, before setting 5½-in. casing to 4,250 ft. for completion attempts. At 4,117-37 ft. gas came to the surface in 2 minutes and it was allowed to flow for 12 hours. At 4,137-57 ft. gas came to the surface in 3 minutes, and the well flowed 14 minutes. The third test flowed oil from 4,180-4,210 ft.

In Grayson County, 4½ miles south of Pottsboro, H. L. Hunt 1 John McCullough cored 2 ft. of shale and 2 ft. of sand at 5,137-43 ft. A drill-stem test at 5,115-43 ft., open 1 hour, recovered 850 ft. of salt water. Bottom-hole pressure was 1,940 psi. in 20 minutes. Cores at 5,257-83 ft. recovered 6 ft. of sand and shale, having a show of dead oil, and a test at 5,250-68 ft. recovered salt water. Operators drilled ahead below 5,328 ft. toward their contract depth of 6,000 ft., or the Strawn.

An exploratory well, being drilled 3 miles south of Orleana in Cooke County, to the Ellenburger or 10,000 ft., was unofficially reported coring below 9,415 ft. in shale, with no further shows below a sand at 8,890-8,930 ft. A drill-stem test at that depth recovered mud.

A total of 52 new locations were made in North Central Texas this week. By counties, they were: Archer, 12, with 10 rigs already running; Baylor 1; Clay 6, Cooke 8, with 33 rigs and locations under way; Denton 1; Haskell 1; Jack 7; Montague 1; Throckmorton 3, which had 6 rigs running in Woodson field; Wichita 5, in addition to 33 rigs and locations under way; Wilbarger 2; and Young 5, which had a total of 33 rigs and locations going from the previous week, including 4 rigs running in the Kendall area.

Oil-field completions for the week in North and West Central Texas, by counties, were: Archer 4; Clay 1, Cooke 3, Jack 1; Montague 1; Throckmorton 4, being 3 in the Parrot field and 1 in the new area 4 miles southeast of Throckmorton; Wichita 7; Wilbarger 1; and Young 1.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Clay County: Fain & McGaha 1 J. Z. Barrington, Blk. 7, J. H. Belcher Subd., 2 mi. SE Deer Creek, dry, TD 5,000 ft., sand with odor 3,315 ft., sand with show oil 4,957-60 ft.

Cooke County: Harvey Drilling Co. 1 W. T. Strader, James Taylor Sur., A-1007, dry, TD 1,204 ft., Ellenburger 1,141 ft.

Cottle County: Ohio Oil Co. 1 Yarbrough, W. Shelton Sur., A-2,011, NE cor. of county, dry, TD 8,300 ft., Ellenburger 7,810 ft., Cambrian sand 8,267 ft.

Montague County: Continental Oil Co. 1 J. B. Williams, McKinney & Williams Sur., A-506, 8 mi. SE Bowie, dry, TD 7,385 ft., Caddo 6,040 ft., Barnett 6,313 ft., Simpson 6,953 ft., Ellenburger 7,303 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCATS

Brown County: Roberts-Benson 1 Mack Henry, Seth Ingram Sur. 154, A-539, 4½ mi. E Crosscutt, flowed 206,000 cu. ft. gas a day, small amount of oil, top Caddo 2,175 ft., perforated 2,125-27 and 2,204-07 ft., TD 2,329 ft.

Stephens County: Texas Pacific Coal & Oil Co. 9-C A. S. Veale, Sec. 1,413, TE&L Sur., 5 mi. NW Caddo, pumped 47 bbl. 42°-gravity oil a day, Marble Falls limestone 3,908-20 ft., TD 3,920 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Brown County: H. M. Hanner 1 Lillie Kellar, Blk. 19, Juan Delagado Sur., 4 mi. E Crosscutt, dry, TD 2,874 ft., Caddo 2,027 ft., Marble Falls 2,806 ft.

H. M. Hanner 1 J. M. Moore Estate, Juan Delgado Sur., Blk. 15, A-241, 7 mi. NW May, dry, TD 1,301 ft. in shale, sand 1,178-1,201 ft.

Callahan County: Bailey & Stebbinger 3-B H. M. Kennard, Sec. 10, ETRR Sur., 5 mi. N Clyde, dry, TD 1,416 ft., sand with show of oil and gas 1,405-15 ft.

Eastland County: Capitol Co. 2 C. E. Allen, John Foster Sur., A-121, 10 mi. SE Ranger, dry, TD 3,258 ft., Marble Falls 2,995 ft., sand with show of oil 3,031 ft.

Shackelford County: L. A. Warren 1 F. W. Alexander, Sec. 578, TE&L Sur., 4 mi. NE Albany, dry, TD 833 ft. in shale.

ILLINOIS

Calvert & Willis Hit Schnell Pool Outpost

MATTOON.—Calvert & Willis, Inc., have hit pay with a 1-mile northwest outpost to Schnell pool, Richland County. Their well, 1 Charles Yunker, NE NW NE 14-3n-8e, on a 1-hour and 35-minute drill-stem test of McClosky at 3,018-21 ft. got gas in 5 minutes, 540 ft. of slightly oil-cut mud, and 110 ft. of salty-sulfur water. On pump test, the well made 140 bbl. oil and 33 bbl. sulfur water in 21 hours.

In area 15 miles northwest of Olney in Clay County, T. Brake Dirickson and Don Slape had very favorable drill-stem test on their 1 Buester, SW SE NE 2-4n-8e. Test of McClosky lime from 3,019-25 ft. got gas in 2 minutes and flowed natural clean oil in 9 minutes. The 1 Buester is 1½ miles from other oil areas.

Wabash, Clay, and Hamilton counties led the state in completions for the week with seven, five, and five respectively. Drilling permits for the week were concentrated in Wayne and Clay counties with 5 for Wayne and 3 for Clay out of a total of 19.

Mid-Continent Buys King's Producing Properties

Mid-Continent Petroleum Corp. has purchased the interests of Sam King, former Tulsa building contractor, in the developed leases of the East Holdenville and Grief Creek pools of Hughes County, Oklahoma. The properties include 11 producing wells.

Arkansas Allowable Set

Arkansas' October crude-oil allowable has been set at 92,252 bbl., divided as follows: controlled oil pools, 68,934 bbl.; controlled gas pools, 6,318 bbl.; and unprorated pools, 17,000 bbl.

Among the

Drilling Contractors

J. R. Hatch has surface casing set and is drilling ahead on Seaboard Oil Co. and Shamrock Oil & Gas Corp.'s wildcat test located 60 miles east of El Paso, Hudspeth County, Texas. The well is on a block of 4,500 acres leased from University of Texas.

Commonwealth Drilling Co., Calgary, Alta., has contract for two wells to be drilled for Socony-Vacuum Oil Co., Inc., in Porcupine Hills, southwest of Nanton, Alberta. Tentative locations have been made on the 7-U ranch in the vicinity of wells drilled some years ago near Willow Creek and Rice Creek, which got oil showings but were not carried to conclusive depth. Equipment is being moved in.

Big Chief Drilling Co., Oklahoma City, will drill a test north of Marshall pool, Logan County, Oklahoma, for Edward P. Baker. The wildcat is 1 Ficken, C E½ SW NE 8-19n-4w, and is scheduled to go to second Wilcox at about 6,300 ft.

Buffalo Drilling Co. has staked location for its 1 F. A. Bailey, 330 ft. from south and 1,198 ft. from west lines, NW SE 28-4s-13w, Posey County, Indiana.

Grayhill Drilling Co., Oklahoma City, is contractor on a favorable-looking test in Katie pool, southern Garvin County, Oklahoma. The well is Dale Rørem 1-B fee, C NW NE 6-1n-1w, on west side of Katie pool. It was drilled to 6,236 ft. and casing set at 6,183 ft. Electric log found a 26-ft. section of porous sand at 6,182-6,208 ft.

Lowell Drilling Co., Wichita, and J. C. Dozier have a good show of oil at their 2 Hays, SW NE SE 28-9-18, in Paradise Creek pool, Rooks County, Kansas. The 2 Hayes hit Arbuckle at 3,569 ft. and set pipe after getting good saturation in top 2 ft. of formation. The well is a southwest offset to the operators' 1 Hayes, NE SE SE, which was finaled in August from Lansing-Kansas City.

California Commercial Drilling Co., Los Angeles, has contract for five General Petroleum Corp. wells in South Belridge field, California.

Gilliam Drilling Co. is planning a wildcat for Edwards County, Illinois, its 1 W. L. Schmidt, NW NE SW 8-1n-14w.

Fowler Drilling Co., Long Beach, is contractor for Warren L. Meeker 1 Jerry, Wilmington field, California.

Meredith, Clegg & Hunt, Houston, have completed as a producer 1 Sweet Lake Land & Oil Co. for Sohio Petroleum Co. in Holmwood field, Cal-

S. A. Berwick, contractor; Roy Roper, driller; F. J. Hammond, motorman; J. C. McKee, derrick man; W. H. Ashcroft, floor man, and W. H. Edwards, backup man, on location at 1 Phillips, of Berwick, Spruill & Harms, 3 miles north of Pratt, Kans.

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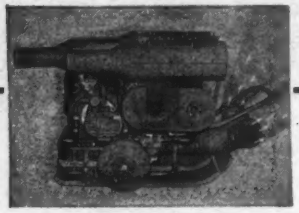

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LONE STAR 2—2 swivels, ½, ½ or ⅝" chain

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HOUSTON

casieu Parish, Louisiana, and have skidded over and are rigging up on the 2 Sweet Lake Land & Oil Co. Contract depth is 10,400 ft.

M. & M. Drilling Co., Owensboro, Ky., is a recently organized cable-tool drilling firm. Officers of the company are F. M. Magruder, president; R. F. Magruder, vice president; and F. E. Moran, secretary-treasurer.

Harvey Drilling Co. is moving in for an Ellenburger test in Cooke County, North Texas. The wildcat is 1 Strader, James Taylor Survey A-1007, 1 mile southwest of Era.

Newton Drilling Co., Coalinga, Calif., will drill a Standard Oil Co. of California well on Standard's Ferguson lease, Jacalitos field, California.

Markham Drilling Co., Mt. Vernon, Ill., has contract for Calstar Petroleum Co. 1 Cox, SW NE NW 5-6s-6e, Hamilton County, Illinois.

Olson Drilling Co., Tulsa, and E. M. Wahlemaier have taken a favorable drill-stem test on their wildcat 18 miles southeast of Sonora, Sutton County, West Texas. The test is 1 Stuart, Section 68, Block 7, TW&NC Survey. On drill-stem test of Strawn lime at 4,152-92 ft., the well showed gas and 11 stands of free oil were recovered with no water.

Woods Drilling Co., New Orleans, and Wilcox Oil Co. have started a test to second Wilcox sand in Pontotoc County, Oklahoma. It is 1 Stevenson, NW SE NE 16-3n-8e, 6 miles south of Steedman pool.

Puritan Drilling Co. is contractor for Fred A. Noah 1 B. Englebright, NE SE SE 18-1s-8e, Wayne County, Illinois.

Dunlap and Graham, Long Beach, have contract for a wildcat for L. M. Lockhart in Marin County, California.

Q. B. Mitchell, Carmi, Ill., is under contract for a Kentucky wildcat, the I. B. Browning 1 Claude Morton, near C WL 24-N-25, 2 miles west of Sebree, Webster County.

Hall-Miller Drilling Co. has contract for L. C. Tharpe et al 1 Perry, SW SE SE 30-13n-1e, a wildcat 1½ miles west of Jones pool, Oklahoma County, Oklahoma. Contract is for 6,000 ft. Shell Oil Co. and Phillips Petroleum Co. are sponsoring the venture.

Rocky Mountain Drilling Co., Los Angeles, has recently received three California contracts including one for a well in Coalinga area for Sharples Oil Corp., and two in Paloma field for Western Gulf Oil Co.

V-T Drilling Co., Evansville, is drilling Ryan Oil Co. 1 W. A. Nisbet Heirs, a wildcat in 21-K-25, 3½ miles east of Madisonville, Hopkins County, Kentucky.

McCall & Kline Drilling Co., Mt. Carmel, Ill., is contractor for W. A. Schuller 1 Fred Pflug, 330 ft. from north and west lines, NW SE SE 20-3s-8w, Gibson County, Indiana. Contract is for 1,750 ft.

Thorne Drilling Co., Henderson, Ky., is contractor for Rod Mitchell and Sun Oil Co. 1 Keeland Community, NE¼ 17-P-21, Henderson County, Kentucky.

Mealy-Wolfe Drilling Co., Tulsa, is drilling a 2,350-ft. test, its 1 W. L. Kistler, Jr., SE SE NW 5-7n-8e, Hughes County, Oklahoma.

Grace Brothers, Wichita Falls, have contract for Nu-Enamel Oil Operating Co. 1 Mock, in southeast of Section 23, Block 11, H&TC Survey A-143, 2 miles northeast of Round Timber, Wilbarger County, North Texas. This wildcat is contracted for 7,200 ft.

Davenport Drilling Co., Duncan, Okla., has under way a 2,000-ft. test in Kiowa County, Oklahoma, its 3 Gibbs, SW SW NE 9-7n-17w.

Jack Hinkle, Carmi, Ill., is under contract for a Gibson County, Indiana wildcat, the Cummings Oil Co. 1 J. Lynch, 90 ft. from north and 420 ft. from east lines, SE SW NW 12-1s-11w.

B & B Drilling Co., Pauls Valley, Okla., holds the contract for an outpost to East Antioch field, Oklahoma, to be drilled by James N. Crofton. The well is 1 Thomas, SW SE NW 8-3n-1w, Garvin County, and is scheduled for Bromide production or 5,300 ft.

R. V. Dillard Drilling Co. has staked location for a 2,500-ft. test in Cotton County, Oklahoma, its 1 Walker, SW SE SE 29-1s-9w.

Gar-Ter Drilling Corp. has staked location for an 8,000-ft. test, its 1 Weiner-Shannon, C NE NE 16, GC&SF Survey, Crockett County, Texas.

Frizzell Drilling Co., Oklahoma City, has hit a producer with its 2 Johnson "F," NE NW SE 18-1w-8w, Stephens County, Oklahoma. The 2 Johnson "F" pumped 12 bbl. per day of 38° A.P.I. gravity oil from Permian sand at 2,210-26 ft.

Cumbie & Collins Drilling Co., Ardmore, Okla., is drilling a 660-ft. test in Garvin County, Oklahoma, its 2 Derdeyn, C SE SW NW 29-1n-3w.

Joy & Kitrell, Falls City, Nebr., are drilling a rotary test for Basin Oil Co. 4 miles east of Oregon, Holt County, northwestern Missouri. The

test is 2 Eggar, SW 33-60n-37w, and is the operator's fourth attempt to find oil in the area.

Coppinger and Southern Drilling Co., Wichita, have contract for a rank wildcat to be drilled by Homer H. Luttrell and M. O. Henry 7 miles southeast of Herzon pool, Ellis County, Kansas. The test is 1 Dreiling, NE NE NW 27-14-16 and is being supported by Carter Oil Co., Solar Oil Corp., and Stanolind Oil & Gas Co.

Drilling permits for nine wildcats have been issued in Michigan. **Muskegon Development Co.** has contract for Superior Oil Co. 1 Heibeck-White Community, SW SW SW 12-8n-4w, Clinton County. **Scott Drilling, Inc.,** will drill its 1 State-Peacock in NW NW NW 14-19n-13w, Lake County. In Montcalm County, **Leonard Drilling Co.** is under contract for Leonard Oil, Inc. 1 Johnson, SE SW NW 7-9n-7w, and **Union Rotary Corp.** has contract for Ashby Oil & Gas Co. 1 Blumberg et al, SE NE 9-10n-8w. **Strom Drilling Co.** will drill Welsh Oil Co. 1 L. P. Munger, SW SW SW 8-15n-18w, Oceana County. **Matlock Well Servicing** is under contract for three wildcats in St. Clair County for Ray W. Matlock. The tests are 1 Simmons, C SW NW 29-3n-16e, 1 Cruikshank, C SE NE 20-3n-16e, and 1 Morrow, C SE SW 20-3n-16e. **Godfrey Drilling Co.** will drill V. & S. Oil Co. 2 Hemstreet, NE NW NW 25-1s-15w, Van Buren County.

Transit Corp. will drill a wildcat 1½ miles south of Morel pool, Graham County, Kansas, for Anderson-Prichard Oil Corp. and Group One of Texon Oil & Land Co. It is 1 Teall, SE SE SE 27-9-21.

Quad Drilling Co. is moving in for Houston Oil 1 Gaughan, SW SW NE 34-13s-16w, a wildcat 3 miles west of Locust Bayou, Calhoun County, Arkansas. Operator has 1,320 acres around the test.

Herndon Drilling Co., Lyons, Kans., has a well under way in Harvey County, Kansas, its 1 Frantz, NE SE NE 11-24-3.

Mars Drilling Co. has contract for a 4,500-ft. test for Nu-Enamel Oil Operating Co., the 1 Rogers, northwest 27 acres of W. B. F. Skinner Survey A-992, 7 miles southeast of Gainesville, Cooke County, North Texas.

Mouser Drilling Co., Wichita, has brought in two good producers in Silica field, Barton County, Kansas. They are 4 Peters, NE NE NW 13-20-11, with a pumping potential of 200 bbl., and 5 Peters, NE NW NE, with a pumping potential of 300 bbl.

McCullough Drilling Co. is under a 3,000-ft. contract for Ashland Oil & Refining Co. 46 Cooper Estate, 330 ft. from north and west lines, NW SW NW 19-3s-13w, Gibson County, Indiana.

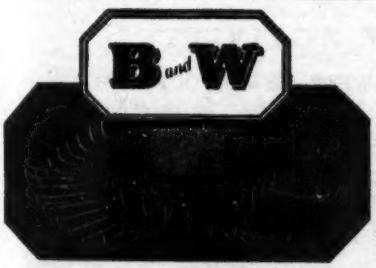
Howard Brunson, Wichita, is contractor for R. L. Williams 1 Eahly, SE SE NW 9-18-11, a wildcat 1 mile north of Ames pool and 1½ miles south of Claflin, Barton County, Kansas. Stanolind Oil & Gas Co. is supporting.

Pioneer Drilling Co. and Foreign Exploration Co. have moved their operating offices from Mount Vernon, Ill., to Casper, Wyo. Walter G. Tschudin and J. E. "Jack" Burden are partners in these companies. They have recently taken over the operation of six rigs for Atlantic Oil Co. of Venezuela.

Derby Drilling Co., Wichita, is drilling a wildcat in Ellis County, Kansas, its 1 O'Laughlin, NW NW NE 18-12-18.

Crescent Drilling Co. has contract for a 6,000-ft. test in Caldwell Parish, North Louisiana, for Southern Carbon Co. The test is 1 United States, SE 26-14n-4e, 3 miles west of Hebert.

Virginia Drilling Co., Wichita, is making hole on a wildcat, its 1 Curtis, NW NW NW 16-24-13, Stafford County, Kansas.



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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 11, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	45	22	0	*23	64,461	1,314	1,239	0	0	0	0	0	3	0	0	2	5
Pennsylvania	73	40	4	†29	122,668	2,338	3,114	0	0	0	0	0	0	0	3	1	4
West Virginia	23	7	10	6	55,629	672	572	1	0	1	1	3	2	0	21	15	38
Ohio	30	8	11	‡11	92,930	1,033	968	0	0	0	2	2	0	0	5	36	41
Indiana	12	6	0	6	18,716	502	289	0	0	0	0	0	22	0	0	35	57
Kentucky	10	3	3	4	22,007	534	361	0	0	0	0	0	8	0	0	33	41
Illinois	50	25	0	25	125,559	1,607	1,794	0	0	0	3	3	56	0	1	272	329
Michigan	24	8	2	14	53,048	694	640	0	0	0	7	7	8	0	10	180	198
Kansas	65	30	9	‡26	215,574	2,039	1,555	1	0	0	10	11	31	0	13	270	314
Neb., Mo., Iowa	0	0	0	0	0	4	15	0	0	0	0	0	0	0	0	4	4
Oklahoma	67	34	8	25	222,471	3,224	2,181	4	0	0	10	14	93	5	17	536	651
Texas	175	124	8	43	775,404	7,058	6,177	5	0	2	26	33	226	48	68	1,066	1,408
North Central (Dist. 7-B & 9)	49	29	2	18	144,945	2,262	2,196	1	0	1	9	11	65	0	10	357	432
West (Dist. 7-C & 8)	53	48	0	5	253,019	1,717	1,347	2	0	0	5	7	30	0	3	131	164
Panhandle (Dist. 10)	10	8	2	0	30,935	354	259	0	0	0	0	0	1	0	1	9	11
Eastern (Dist 5 & 6)	10	4	1	‡5	48,974	410	554	0	0	0	3	3	8	2	5	90	105
Gulf Coast (Dist. 3)	29	20	2	7	174,000	1,223	1,366	1	0	1	5	7	56	34	29	227	346
Southwest (Dist. 1, 2 & 4)	24	15	1	8	123,531	1,092	455	1	0	0	4	5	66	12	20	252	350
Louisiana	35	24	2	9	158,494	1,163	1,089	1	0	0	4	5	32	18	9	158	217
Northern	25	16	2	7	64,948	672	605	0	0	0	3	3	3	1	3	96	103
Southern	10	8	0	2	93,546	491	464	1	0	0	1	2	29	17	6	62	114
Arkansas	11	7	1	3	36,366	235	141	0	0	0	1	1	1	0	0	43	44
Mississippi	7	5	0	2	61,077	372	192	0	0	0	1	1	1	0	1	71	73
Southeastern States	3	0	0	3	14,630	49	35	0	0	0	3	3	0	0	0	42	42
Montana	6	4	1	1	13,369	222	249	0	0	0	0	0	6	0	5	20	31
Wyoming	7	3	0	4	28,266	187	133	0	0	0	3	3	11	0	4	32	47
Colorado-Utah	7	7	0	0	45,085	160	122	0	0	0	0	0	2	0	3	38	43
New Mexico	15	12	2	1	79,544	415	319	0	0	0	1	1	5	0	1	30	36
California	45	35	1	9	190,732	1,522	1,247	1	0	0	8	9	40	0	6	219	265
Total United States	710	404	62	244	2,396,030	25,344	22,412	13	0	3	80	96	547	71	167	3,103	3,888
Total previous week	698	367	69	262	2,331,242	24,634	21,854	18	2	3	81	104	534	71	164	3,023	3,792
Total October 12, 1946	558	297	61	200	1,738,857			15	1	2	63	81	438	33	97	2,662	3,230

Service wells included: *23, †29, ‡1.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
18-18.9	$1.80	....	....	....
19-19.9	1.85	....	....	....
20-20.9	1.69	$1.85	....	$1.42
21-21.9	1.73	1.87	....	1.44
22-22.9	1.77	1.89	....	1.46
23-23.9	1.80	1.91	....	1.48
24-24.9	1.84	1.93	$1.90	1.50
25-25.9	1.86	1.95	1.92	1.52
26-26.9	1.91	1.97	1.99	1.54
27-27.9	1.95	1.99	1.92	1.56
28-28.9	1.99	1.71	1.94	1.58
29-29.9	2.02	1.73	1.96	1.60
30-30.9	2.06	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.05	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*Standard Oil Co. of Calif. posting. †For crude from Daboval, El Campo, and Sandy Point. ‡Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED OCTOBER 4

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	885	2,116	164	1,343	1,748	18,530	9,284	19,176	10,060
Appalachian:									
District 1	105	343	47	97	99	2,214	486	747	402
District 2	63	199	20	54	114	882	112	224	225
Ind., Ill., Ky.	824	2,968	340	942	1,048	14,466	3,059	8,486	5,473
Okla., Kans., Mo.	442	1,530	191	506	486	6,770	1,335	3,474	1,539
Inland Texas	238	1,031	105	141	412	2,506	638	562	831
Texas Gulf Coast	1,344	4,130	726	1,726	1,895	13,671	3,921	9,106	8,057
La. Gulf Coast	381	1,181	305	434	451	4,689	2,158	3,004	2,219
N. La., and Ark.	65	167	45	47	87	1,574	471	356	214
Rocky Mountain:									
New Mexico	11	36	4	9	18	71	15	21	30
Other Rocky Mtn.	129	354	17	149	220	1,527	160	917	691
California	822	2,403	105	791	1,939	14,727	1,139	14,150	27,763
October 4, 1947	5,309	16,458	2,071	6,241	8,517	81,607	22,778	60,223	57,504
September 27, 1947	5,290	16,501	2,022	6,136	8,580	82,472	22,829	60,406	56,777
October 5, 1946	4,821	15,332	1,642	5,526	7,965	86,962	21,368	63,489	59,725

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 224,229,000 bbl. as of October 4—down 765,000 bbl. One year ago 221,782,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.			
East Texas	$1.95	Pecos County, Texas (Yates)	1.85
Kettleman Hills, California*	2.14	Bradford, Pennsylvania	4.30
Beauregard Parish	1.96	Eastern Ill. and Western Ind.†	2.07
Illinois Basin	2.07	Tomball, Texas Gulf Coast	2.10
		*37°-37.9°. †35° and above.	

TRENDS

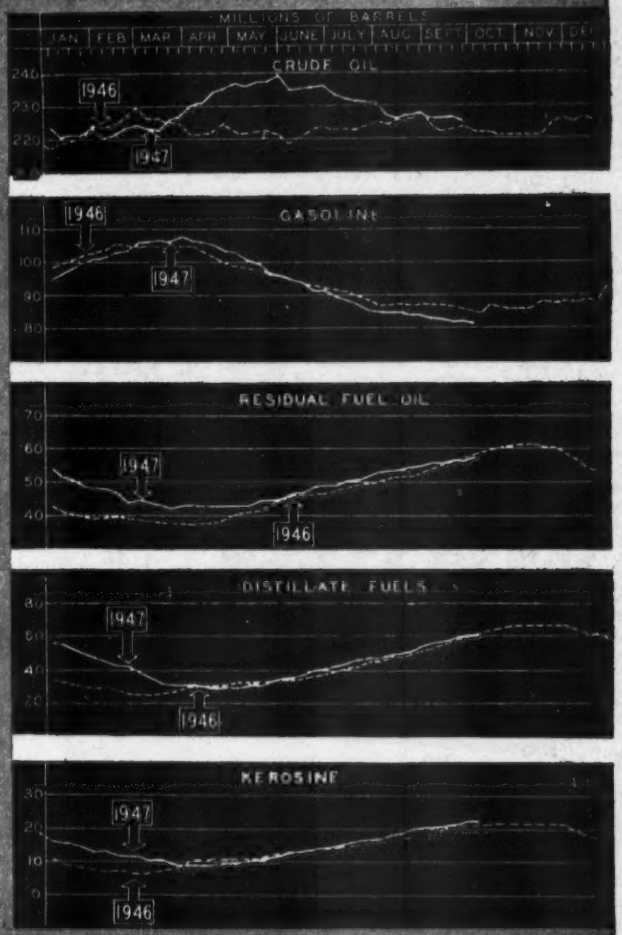
DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 11 crude oil	B. of M. Oct. demand	Oct. 4 crude oil
Alabama	1,150	1,200	1,050
Arkansas	82,900	82,000	82,050
California	921,300	930,000	920,400
Colorado	47,920	46,000	47,150
Eastern	64,600	65,200	63,050
Florida	1,050	1,000	1,100
Illinois	172,800	200,000	170,600
Indiana	17,600	18,000	17,000
Kansas	288,050	309,000	288,200
Kentucky	25,700	26,000	25,600
Louisiana	452,050	450,000	446,375
North Louisiana	111,450	.....	109,200
South Louisiana	340,600	.....	337,175
Michigan	48,250	45,000	40,690
Mississippi	98,080	100,000	101,830
Montana	25,250	24,000	21,960
Nebraska	550	600	550
New Mexico	116,750	112,000	117,000
Oklahoma	402,300	405,000	388,800
Texas	2,376,350	2,300,000	2,358,100
Dist. 1 (Southwest)	24,400	.....	24,350
Dist. 2 (Southwest)	162,150	.....	161,525
Dist. 4 (Southwest)	260,425	.....	254,923
Dist. 3 (Gulf Coast)	492,375	.....	495,600
Dist. 5 (Eastern)	41,060	.....	40,975
Dist. 6 (Eastern)	118,300	.....	118,425
East Texas Field	321,000	.....	315,425
Dist. 7-C (West)	40,590	.....	40,875
Dist. 8 (West)	646,225	.....	642,550
Dist. 7-B (W. Central)	43,975	.....	42,700
Dist. 9 (N. Central)	136,500	.....	132,750
Dist. 10 (Panhandle)	89,350	.....	88,000
Wyoming	118,020	125,000	119,930
Total United States	*5,260,680	5,240,000	5,211,435
Change from prev. wk., up	49,245		

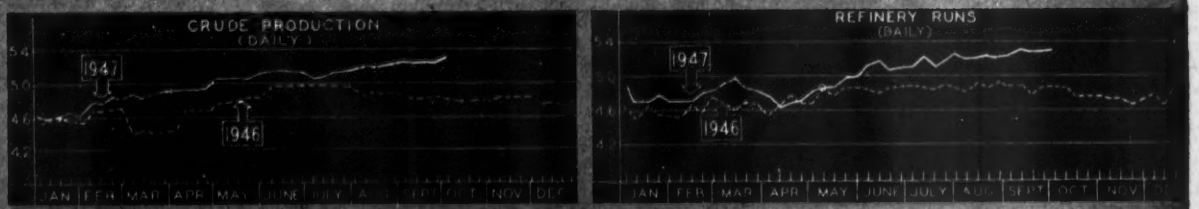
Total production January 1-October 11 †1,424,854,460 bbl.
Same period last year (crude plus cond.) 1,347,688,215 bbl.

*Not incl. 41,465 bbl. condensate. †Incl. 9,197,540 bbl. condensate.

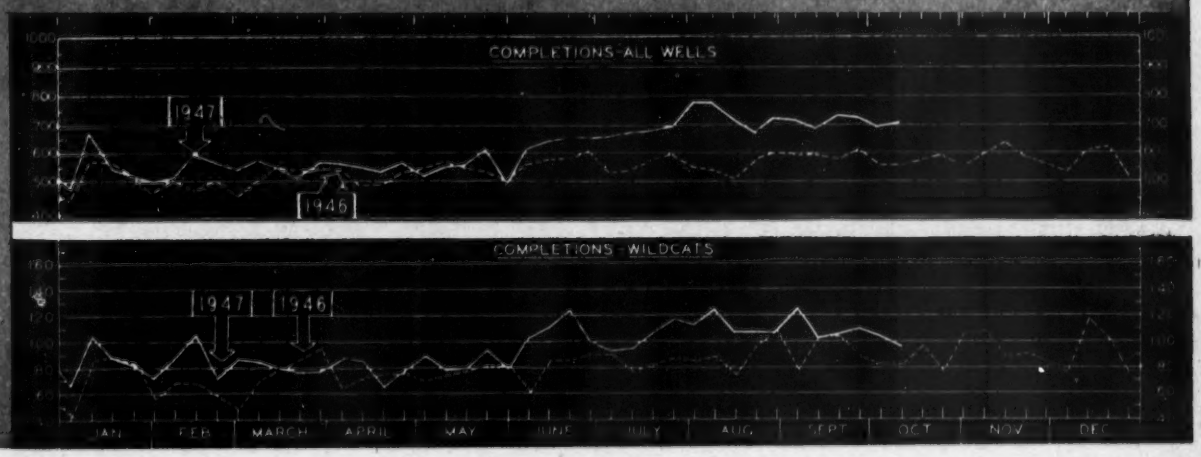
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.



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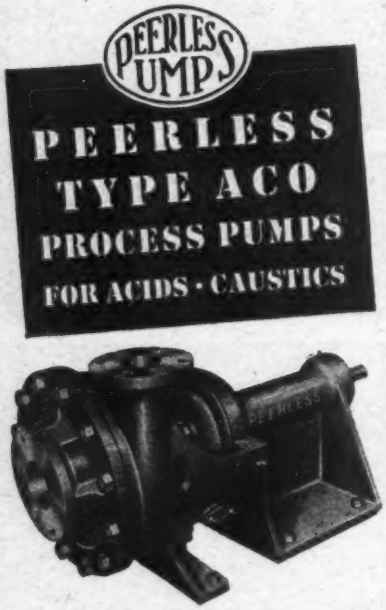
Compare the pumps presently handling your corrosives with the Peerless Type ACO, especially developed for pumping acids and caustics. The Type ACO is a single stage, single suction pump with the volute and drip pocket cast integral, of special alloys to suit the solution being pumped. Bronze, stainless steel, Monel, NI-resist can be furnished. Stuffing box is long and extra deep with special opening affording easy accessibility. Drive is electric motor through flexible coupling. Capacities up to 800 g.p.m. can be handled against heads to 200 feet.



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Special passage vents into discharge. Eliminates conventional screwed valve which often corrodes.

DRIP POCKET DRAIN:
A flange and two bolts which can be made of stainless steel replaces screw type fitting ordinarily used for this purpose.

VERTICAL SPLIT:
Utilizes one piece circular gasket; easier handling and replacement assured by this design.

INBOARD END CAP:
Special alloy cap prevents liquid passing water slinger into bearing housing.

NEW BULLETIN: Fully describes and illustrates these and additional refinements in Type ACO design. Write for Bulletin D-2400.

PEERLESS PUMP DIVISION
FOOD MACHINERY CORPORATION
Factories: Los Angeles 31, Calif.; Quincy, Ill.; Indianapolis, Ind. *District Offices:* Chicago 40, 4554 North Broadway; Philadelphia Office: Suburban Square, Ardmore, Pa.; Atlanta Office: Rutland Building, Decatur, Georgia; Dallas 1, Texas; Los Angeles 31, California.

MARKETS

PRICES of petroleum products in many sections of the country moved up to fractionally higher levels early this week as a result of both increased freight rates and continued heavy demand pressure on suppliers.

Action of the railroads in making effective October 13 a 10 per cent blanket freight raise authorized a few days earlier by the Interstate Commerce Commission was expected to be quickly reflected in higher tank-wagon prices generally.

Late last week, refiners were rushing loadings to beat the October 13 deadline. For shipments from Group 3 to much of the North-Central section, the freight increases approximate ¼ cent per gallon. To Minneapolis, for example, the additional cost is about $22.50 per 8,000-gal. tank car.

Traffic officials last week explained that the emergency increase is figured by totaling freight bills under old tariffs and adding the flat 10 per cent to all charges except those specifically exempt, including demurrage, drayage, and refrigeration. *(For other information on the freight increase, see page 93).*

Indiana Standard Up

Standard Oil Co. (Indiana) advanced the price of gasoline 3/10 cent a gallon effective October 13 to offset the higher freight rates.

Deep Rock Oil Corp. announced an immediate increase in tank-wagon prices equal to the freight increases. At the same time, this company made an additional general raise in tank-car and tank-wagon prices for heating oil and diesel fuel. Tank-car prices for heating oils, diesel fuel, and kerosine went up ⅛ cent, making the price for 42-44 kerosine 7¾ cents, range oil, 7⅜ cents, and No. 2, 7⅛ cents. Tank-wagon prices were advanced ½ cent on range oil and domestic heating oil, and 1 cent on diesel fuel.

Price increases in the Mid-Continent and Midwestern areas seemed justified on the basis of continuing record heavy demand. The only product not extremely strong was No. 6 residual fuel oil, and even for this, suppliers said material sold for November and later delivery is bringing prices ranging up to $2.45 per barrel. At the present, however, warm weather and overfilled storage resulted in offers reported as low as $1.90.

On the Gulf Coast, demand continued steady for all products with slightly higher prices quoted when any products became available. This was especially true on cargo sales. A tanker shipment of regular gasoline last week is reported to have brought 11 cents while some No. 2 fuel oil moved for as high as 8½ cents. Residual fuel is reported to be becoming slightly more available with one cargo bringing $2.75.

Prices in the New York harbor were generally unchanged. In the East, industry executives were expressing concern over the possibility of short fuel-oil supplies this winter. *(See page 94).* In San Francisco, Standard Oil Co. of California announced an increase of 5 cents per barrel for light and heavy fuel oil for all types of delivery in Washington, Oregon, and at Eureka, Calif. The increase, the company said, is necessary to recover actual cost of transportation to distribution points.

Representative Quotations

Representative spot-market quotations of leading suppliers as of October 15, 1947. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8¾-10½	10.5-10.9* 9.3-9.10†	9-10½
Premium gasoline, 78-80 octane	9¾-11¾	10.2-12	9½-11½
42-44 w.w. kerosine	7⅜-8	7.8-8.3	7½-8¼
No. 2 straw fuel oil	6⅞-8½	6.8-7.2	7¾-8¼
No. 6 residual	$1.90-2.25	$2.22-2.52	$2.00-2.52

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6¾	5⅞	6½
Grade 18-55	7.65	7.05	7.35

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	11-12¾
750 vis., No. 3-4 neutral	13-14½
2,000 No. 5-6 neutral	14½-16

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 p.p.	20
200 vis. No. 3 neutral, 0-10 p.p.	16-19

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	45
180 vis. p.t. neutral	42

CRUDE-SCALE WAX
Mid-Continent

130-132 A.S.T.M. melting point	6¾-7¾

Phillips' Personnel Hold Annual Meeting

(Continued from page 80)

ers," was the well-completion subject of S. T. Walker. And for the Permian Basin side of this phase, "Improved Cementing Technique for Intermediates and Oil-String Casing" was outlined by C. M. LaLonde. Another new equipment item—damond-core drilling—was covered as to methods and economics by Hugo Reicken.

To take one important producing operation—the handling and storage part—both the theoretical side and field results of two-stge separation for distillate and oil wells were described by C. M. Boles. H. A. Carlson talked on the causes and prevention of corrosion in high-pressure condensate wells. Problems in the interpretation of electric logs are common rather than uncommon, and since the company has been drilling 400 or more wells in each of recent years, the talk on that subject, by R. G. Piety, had full attention.

One outside speaker was W. W. Finlay, Guiberson Corp., Dallas, who explained "The Indoctrination and Training of Foreman." Superintendents, office managers, and production-accounting personnel also listened closely to prepared discussions on method studies, well-servicing unit mechanics, economics of contract labor, on-the-job training for clerks, individual well record forms, preparation of circular letters and forms, office and field accounting procedures, and evaluation of group accident and sickness benefits.

A.P.I. Program

(Continued from page 93)

Sponsored by Agricultural Development Committee. Program to be announced.

Group session, Lubrication, 8:00 p.m.—Sponsored by the lubricating committee. Program to be announced.

TUESDAY, NOVEMBER 11

Group session, Taxation Forum, 10:00 a.m.—(Stevens-North Ballroom). Sponsored by the American Petroleum Industries Committee. Russell E. Singer, executive vice president, American Automobile Association, Washington, "Your Customers Look at the Future"; a speaker for ""The Role of Commercial Highway Transportation in America's Progress," will be announced; also an additional subject and speaker will be scheduled.

Group session, Division of Refining, Sour Crude Processing, 10:00 a.m.—(Stevens' Grand Ballroom). Harold M. Smith, U. S. Bureau of Mines, Bartlesville, Okla., "Sour Crudes—Trends in Supply"; M. J. Fowle and R. D. Bent, Atlantic Refining Co., Philadelphia, "Sour Crudes—Some Processing Answers"; E. Q. Camp, Humble Oil & Refining Co., Houston, "Sour Crudes—Equipment Protection." A report of the division's nominating committee, of which A. H. Calderwood, Shell Oil Co., Inc., San Francisco, is chairman, will be given. Election of members of the general committee of the Division of Refining.

Group session, Marketing Division, 10:00 a.m.—Papers on the following subjects are now under consideration, speakers to be announced: "Today's Fuel-Oil Problems," "Consumers' Preference Survey on Facilities and Products at Service Stations," and a panel discussion on "How Can A.P.I. Best Aid All Oil Marketers."

Meeting of A.P.I. board of directors, 10:00 a.m.

Group session, organized reserves of the Air Force (Army and Navy), 2:30 p.m.—Sponsored by A.P.I. interim committee on organized reserves. C. E. Cummings, The Texas Co., Beacon, N. Y., presiding. Papers on the following subjects are now under consideration. Speakers representing Air Force, Army, Navy, and Industry to be announced: "Reserve and Affiliation Program for National Defense," "Army Correspondence Courses and Training," and "Army Composite Units."

Group session, Drilling and Production, 2:30 p.m.—Sponsored by the central committee on drilling and production practice. John E. Sherborne, Union Oil Co. of California, Whittier, Calif., and R. O. Garrett, Arkansas Fuel Oil Co., Shreveport, presiding. J. E. Warren, Carl B. King Drilling Co., Midland, Tex., "Economic Trends in Contract Drilling"; Ernest B. Miller, Jr., Tide Water Associated Oil Co., Houston, "A Survey of Dual Completions"; Edgar Kraus, Atlantic Refining Co., Dallas, "M.E.R.—A History"; and Robert H. Lemore, Well Explosives, Inc., Fort Worth, "The Theory and History of Shaped Explosives Charges."

Meeting of board of councilors, 2:30 p.m.—Candidates for election as members of the board of directors will be nominated.

Group session, Public Relations, District Committees' Forum, 8:00 p.m.—Program to be announced.

WEDNESDAY, NOVEMBER 12

Group session, Secondary Recovery, 9:30 a.m.—Sponsored by the central committee on drilling and production practice. H. H. Kaveler, Phillips Petroleum Co., Bartlesville, Okla., and W. L. Horner, Barnsdall Oil Co., Tulsa, presiding. Earl Foster, Interstate Oil Compact Commission, Oklahoma City, "Plans and Purposes of Interstate Oil Compact Dealing with Secondary Recovery"; D. V. Carter, Magnolia Petroleum Co., Dallas, "The Formation and Operation of Cooperative Projects in Secondary Recovery"; W. S. Morris, East Texas Salt Water Disposal Co., Kilgore, Tex., "Results of Water-Injection in Woodbine Reservoir of the East Texas Field"; and W. B. Berwald, Ohio Oil Co., Findlay, Ohio, "Economic Factors in Secondary Recovery." A report of the division's nominating committee, of which F. E. Rice, Phillips Petroleum Co., Bartlesville, Okla., is chairman, will be given. Election of members of the general committee of the Division of Production.

Group session, Division of Transportation, 9:30 a.m.—(Palmer House). B. Brewster Jennings, Socony-Vacuum Oil Co., Inc., New York, presiding. Dr. John H. Frederick, professor of transportation, University of Maryland, College Park, Md., "The National Transportation Survey"; M. G. Gamble, Standard Oil Co. (N. J.), "Tanker Transportation and Remarks on Inland Waterway Operations"; B. E. Hull, Trans-Arabian Pipe Line Co., San Francisco, "Pipelining in the Middle East"; and J. W. Sinclair, Union Oil Co. of California, Los Angeles, "The Future Problems of Transportation of Petroleum by Highway." A report of the division's nominating committee, of which Porter L. Howard, Sun Oil Co., Philadelphia, Pa., is chairman, will be given. Election of members of the general committee of the Division of Transportation.

Meeting of board of directors, 10:00 a.m.

Board of directors, luncheon, 12:30 p.m.

General session, 2:30 p.m.—Report of board of councilors and election of directors. William R. Boyd, Jr., president, American Petroleum Institute, New York, will give an address. Hon. J. A. Krug, secretary of the Interior, Washington, also will speak.

General session, 8:00 p.m.—This session will include some speakers who have accepted invitations to speak at general sessions but have not yet been assigned to a particular session. They are: B. Brewster Jennings, president, Socony-Vacuum Oil Co., Inc., "The International Petroleum Situation"; Bruce K. Brown, president, Pan American Petroleum Corp. and chairman, military petroleum advisory committee of the Oil and Gas Division and Army-Navy Petroleum Board, "Petroleum and Its Relation to National Defense"; Hiram M. Dow, chairman, Interstate Oil Compact Commission, "The Conservation of Oil and Gas"; Walter S. Hallanan, president, Plymouth Oil Co., and chairman, National Petroleum Council, "Solving Petroleum-Industry Public Relations"; and Henry J. Taylor, author, journalist, economist, and radio commentator, New York, "Looking Ahead at Home and Abroad."

THURSDAY, NOVEMBER 13

General session, 9:30 a.m.—To include some of those general-session speakers as yet unassigned.

Executive committee of the board of directors, luncheon, 12:15 p.m.

South Texas Geological Group Plans Meeting

Morning and afternoon technical sessions plus two field trips will feature the fourteenth annual meeting of the South Texas Geological Society November 5-8 in San Antonio. It is also the mid-year regional meeting of the American Association of Petroleum Geologists.

The technical program is designed to present and explore problems encountered by those engaged in petroleum exploration in South Texas. The first field trip includes inspection of new oil fields in Atascosa County producing from the Navarro sand and Edwards lime formations. The second field trip includes inspection of laboratory facilities of the Foundation of Applied Research.

Very Little Hole Enlargement With Driscose

Caliper surveys of the diameters of several wells drilled with Driscose-base mud have shown less hole enlargement than with other types of muds, the Driscose-drilled holes being much nearer bit gage. In the article, "Practical Application of Carboxymethylcellulose In Drilling Muds," by J. R. Pettigrove, in the issue of October 11, 1947, the captions of Figs. 2 and 3 on page 170 were reversed. The correct situation is that the well in which the Driscose-base mud was used was represented by the left-hand caliper log. This log showed very little hole enlargement.

Oil Scouts to Meet

A meeting of the board of the National Oil Scouts and Landmen's Association has been scheduled at Dallas in the Hotel Adolphus, November 15. A place and date and other plans for the 1948 Silver Jubilee national meeting will be determined at that time.

EQUIPMENT MEN ... in the News

Two Executive Appointments in Cardwell

Cardwell Mfg. Co., Inc., Wichita, has announced two executive appointments in the organization. Card-

A. HARVEY

W. O. TIMBERLAKE

well general manager since 1940, Arthur "Pat" Harvey, will serve in the future as vice president in charge of the company's export operations, with offices at 570 Lexington Avenue, New York City. W. O. Timberlake, who has been with the company since last April, succeeds Harvey as general manager.

Harvey has been with the organization since July 1934, first as sales representative in California, then as sales manager, succeeding to the position of general manager in 1940. Timberlake, prior to joining Cardwell, had been engaged in the installation, development, and sales of oilfield machinery. Thirteen years of this time were spent with Continental Supply Co. in East Texas, Kansas, and Oklahoma fields. Three years were spent in Naval aviation research and development.

James Herrick, formerly in charge of the New York office which is now to be headed by Harvey, will in the future cover the Middle and Far East for Cardwell, with headquarters in Cairo, Egypt.

Cooper Elected by International Nickel

Lance H. Cooper, of London, a member of the staff of Mond Nickel Co. for 20 years and one of its delegate directors since 1945, has been elected an assistant secretary and assistant treasurer of International Nickel Co. of Canada, Ltd.

Hewitt Names Waser

James D. Waser, formerly of Rochester, has been appointed new manager of molded goods sales, Hewitt Rubber Division, Hewitt-Robbins, Inc., Buffalo.

Blake Named Assistant Director of Research

Dr. E. S. Blake has been appointed assistant director of research for Monsanto Chemical Co.'s Merrimac Division. Dr. Blake, who was graduated from University of Michigan in 1931, served until 1936 as a chemist for the state of Michigan. In the latter year he joined Monsanto as a research chemist in the rubber service department of the company's Organic Chemicals Division at Nitro, W. Va. In 1942 he was promoted to group leader in the rubber service department and has served in that capacity until his present appointment.

Rowell Moves Headquarters

J. W. (Bill) Rowell, sales representative of Well Equipment Manufacturing Corp., Houston, moved his headquarters from Marshall, Tex., to Monroe, La. Rowell covers the East Texas, North Louisiana, South Mississippi, and South Arkansas fields and his move to the Monroe location is designed to give better service to WECO equipment users in that area of activity.

Beriswill Named Assistant Sales Manager

Milwaukee Hydraulics Corp., manufacturers of the all-hydraulic Hydro-Crane, announces the appointment of W. G. (Bill) Beriswill as assistant sales manager. Beriswill will spend a good part of his time traveling and will appoint and work with distributors who will handle the Hydro-Crane.

Regan Opens New Store

Regan Forge & Engineering Co., Los Angeles, has established a branch in Bakersfield to serve the oil industry in the San Joaquin Valley. The plant is equipped to service and repair all Regan products and other heavy oil-field machinery as well as do general machine work. J. W. Thatch has been named general manager of the plant. Appointed to work with Thatch is Clifford E. Van Stone, who will be his assistant and will work as sales representative in the Central California area.

Timken Names Edwards

H. C. Edwards, chief engineer of research and development, has been appointed director of research and development to succeed J. F. Leahy, 65, who retired recently after 45 years of service with The Timken Roller Bearing Co., Canton, Ohio. Walter F. Green, assistant manager of research and development, will become manager of research and development.

In order to serve oil operators in both domestic fields and overseas more effectively, S. B. Bowen Co. has recently transferred its manufacturing plant from Huntington Beach to Santa Fe Springs, Calif., where every department has been enlarged and equipped with the newest and finest machinery. Present officers of the company are: Paul Bowen, vice president; R. H. Allen, secretary; and D. Siracusa, assistant secretary

Wold Member of Controllers Institute

L. T. Wold, controller of Kobe, Inc., Huntington Park, Calif., has been elected to membership in the Controllers Institute of America. The institute is a technical and professional organization of controllers devoted to the improvement of controllership procedures.

Kinkade Speaks Before A.I.Ch.E.

The annual meeting of the Oklahoma section of the American Institute of Chemical engineers at Bartlesville, on October 11, was the occasion for an address on "Heat Transfer" given by H. J. Kinkade, sales manager, oil field and heavy industrial units, Young Radiator Co., Racine, Wis.

Kinkade's technical presentation of his subject was illustrated by the use of slides, showing equations incident to the problems of efficient heat transfer under varying conditions. In his discussion, Kinkade dwelt at length upon the basic problem of transferring heat from one fluid in motion, to another through a metal wall. He stressed the fact that "the area of heat transfer surface is a large factor in the cost of heat transfer equipment" and, therefore, it should be "kept at a practical minimum."

Newton Appointed by Lincoln Electric

R. H. Newton has been appointed to a newly created office of manager of dealer sales for Lincoln Electric Co., Cleveland. Newton has been brought to Cleveland from Minneapolis, where he was district sales manager, to franchise and organize welding-equipment dealers throughout the country.

The long-established Lincoln policy of selling to the industrial field through direct technical representatives will not be disturbed, and the policy of assisting manufacturers to design for welding through engineering service will be strengthened.

Westinghouse Sales Executives Appointed

John E. Payne, formerly manager of industrial sales, has been named manager of all industry sales departments for Westinghouse Electric Corp., with general over-all responsibility for sales of equipment to all industries. R. S. Kersh, who has been manager of the company's Houston office since 1942, was named manager of industrial sales to succeed Payne. Both men will be located at the East Pittsburgh, Pa., plant.

Formica Schedules Sales Conference

Invitations to the annual sales, merchandising, and advertising conference of Formica Insulation Co., Cincinnati, have been extended to 70 sales representatives for the sessions to be held in Cincinnati, October 22, 23, and 24. Morris Sanders, New York, who is a consultant on plastic products and development for Formica, will be guest speaker at the conference. Sessions will be held at the factory auditorium during the day. There are two dinner assemblies sponsored for evening social programs.

Monsanto Elevates Canadian Officials

Arnold H. Smith, acting managing director of Monsanto (Australia) Pty. Ltd. has been elected vice president and member of the board of directors of Monsanto (Canada) Ltd. and will assume his duties January 1, 1948.

Irving C. Smith, vice president and member of the board of directors of Monsanto (Canada) Ltd., has resigned effective January 1 to accept promotion to assistant general manager of Monsanto's western division, with headquarters at Seattle.

Paschall to Middle East

Hearn J. Paschall, sales and service engineer of H. C. Smith Tool Co., is now in the Middle East where he is making an extensive tour of the various oil fields throughout that area. Paschall is making his headquarters at Cairo and will be the exclusive representative for his firm in the Middle East.

Wickwire Spencer Names TenHoopen

Paul E. TenHoopen has been appointed sales manager of the Realock Fence Department of Wickwire Spencer Steel Division of Colorado Fuel & Iron Corp. under J. S. Eskin, general manager of fence sales for the corporation and subsidiaries. TenHoopen will be located in the Curtiss Building, 361 Delaware Avenue, Buffalo. William J. Murray will continue as assistant sales manager at 500 Fifth Avenue, New York.

Audley Representative In United States

J. W. Taylor, works manager of Audley Engineering Co., Ltd., Newport, Shropshire, England, is visiting the valve manufacturing plants of Rockwell Manufacturing Co. to study methods and equipment used in valve building in this country.

Audley is the British licensee for the manufacture of Nordstrom lubricated plug valves, built in the United States by the Nordstrom Valve Division of Rockwell Manufacturing Co.

Taylor's visit will include a study of the Rockwell plants at Oakland, Calif., Hopewell, N. J., Pittsburgh, and East Chicago, Ind.

Jack Loban Joins Unibolt

Jack Loban, formerly of Edmond, Okla., where he represented the oil-field-chain division of Link-Belt Co., has been employed by Thornhill - Craver Co. as salesman in the Houston district. Loban is widely known in Mid-Continent oil circles where he has been engaged in the oil-tool business for a number of years.

Hinderliter Acquires Nail-It Rights

Hinderliter Tool Division of H. K. Porter Co., Inc., Tulsa, announces its acquisition of all manufacturing rights for "Nail-It" pipe couplings, "Nail-It" mud guns, "Nail-It" swivel joints, and pump suction couplings. Manufacture of these products will begin immediately at Hinderliter's Tulsa works under the new trade name of "Nail-It-Kwik."

Smith Denver City Manager

Jack Smith, formerly storeman in the Odessa, Tex., store of Oil Well Supply Co., U. S. Steel subsidiary, has been named manager of the Denver City, Tex., store. A native of Pilot Point, Tex., Smith joined Oil Well Supply at the Odessa store in March 1946. He was an Army Air Forces pilot in World War II.

Classified Advertising

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FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
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FOR SALE: 150,000 board feet of used road lumber located in Thornwell Pool Section 25-11-5w, Jefferson Davis Parish, Louisiana. Please contact O. C. Brown, Cities Service Oil Company, Gladewater, Texas.

EQUIPMENT FOR SALE

FOR SALE: 2470' 2⅜" National drill pipe with 2⅜" tool joints. This is 10# pipe and is in good condition. $2.00 per foot. 22' lengths. Mack Contracting Company, Levelland, Texas.

FOR SALE: New 5" x 10" Worthington TYPE KMS-1 Pump. Box B-733, The Oil and Gas Journal, Tulsa, Oklahoma.

SPECIAL
LEAD COVERED CABLE

New—On Original Reels. Standard Construction.

No. 2 Stranded 3 Conductor Type RL, 600 Volts

270 Rolls ..... Approx. 500 ft. ea.
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NEW Gruva-grip and Victaulic Couplings, complete with bolts and gaskets, attractively priced

120,000 pcs. 6" Standard Pipe Size
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We cannot guarantee to furnish any particular make but at present we have both makes in stock.

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2nd Ave.—50th, 51st St., Brooklyn 32, N. Y.
Phone: Windsor 9-8300

EQUIPMENT FOR SALE

200 SULLIVAN Drilling Rig thoroughly reconditioned. Complete with drill pipe, tools, and trucks. Also reconditioned 37 Sullivan complete. This is good equipment. F. D. Bridges, 1109 Euclid, Oklahoma City, Okla. Phone 3-7810.

FOR SALE: Super J Fort Worth Spudder, complete string tools, 20" down to including 5" with new 3000'—⅞" line. 1st class condition to start drilling, nothing needed. J. R. Fester, 309 North 15th, Fredonia, Kansas.

FOR SALE

2—125 H.P. 350# Working Pressure "OIL WELL BOILERS," EXCELLENT condition. Completely reconditioned. Not used since last approval by State Boiler Inspector. Priced to sell.

POWEL BRISCOE, INC.
1916 First National Bldg.
Oklahoma City, Oklahoma

FOR SALE

20—2,000 Gal. Gasoline Tanks, with Pumps and Motors mounted on semi-trailers. 20—New A.P.I. High 500 bbl. Bolted Steel Tanks. 10—New A.P.I. Low 500 bbl. Bolted Steel Tanks. 10—1,000 bbl. new A.P.I. Bolted Steel Tanks. 2—10,000 bbl. New A.P.I. Bolted Steel Tanks. Also new Welded Steel Tanks. Also used Oil, Grain and Water Tanks in all sizes.

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SHOT HOLE WELLS

Large and Small

All are truck mounted, rotary, chain pull down, smallest pump size 4 x 6. Some are in excellent condition; others need repair. Price F.O.B. Dallas, from $3,000 to $8,000, including truck.

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1—45-C Star Spudder; Climax Engine; Tools complete with wire line and hand tools.

1—Heavy Duty Steel Spudder; Young Engine; Tools complete with wire line and hand tools.

Butane-Propane Equipment

CASING

300'—15½" 70-pound L. W.

700'—13⅜" 48 pound H-40

2000'—10¾" 40.5-pound H-40

Will sell casing with either string of tools.

All located Tulsa area and in excellent operating condition.

Box B-933,
The Oil and Gas Journal,
Tulsa, Okla.